

**ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT
INTENTIONAL RADIATOR CERTIFICATION TO
FCC PART 15 SUBPART C REQUIREMENT**



OF

FCC ID: IMK-HRFUSB2

USB WIRELESS LAN ADAPTER

MODEL NO: PROXIM 4240 SYMPHONY HOME RF USB ADAPTER

REPORT NO: 01U0853-1

TEST DATE: JUNE 19, 2001

Prepared for
PROXIM, INC.
510 DEGUIGNE DRIVE
SUNNYVALE, CA 94085, U.S.A.

Prepared by
COMPLIANCE ENGINEERING SERVICES, INC.
561F MONTEREY ROAD,
MORGAN HILL, CA 95037, USA
TEL: (408) 463-0885

NVLAQ[®]
LAB CODE:200065-0

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1. VERIFICATION OF COMPLIANCE

COMPANY NAME: PROXIM, INC.
510 DEGUIGNE DRIVE
SUNNYVALE, CA 94085

TELEPHONE NO : (408) 731-2700

TECHNICAL PERSON: PETE GARCIA/SENIOR RF TECHNICIAN/(408) 731-2762
INFO. CONTACT: KEITH GLOVER/VP OF FINANCE/(408) 731-2706

EUT DESCRIPTION : USB WIRELESS LAN ADAPTER

MODEL NAME : PROXIM 4240 SYMPHONY HOME RF USB ADAPTER

DATE TESTED : JUNE 15, 2001

LIMITS APPLY TO: FCC PART 15 SECTION 15.247

TECHNICAL LIMITS	TEST RESULT
Radiated Emission/15.205 & 15.209	Complies
Radiated Emission/15.109	Complies
AC Line Conducted Emission	Complies
Minimum 20dB Bandwidth	Complies
RF Power Output	Complies
Minimum Number of Hopping Channels	Complies
Channel Separation	Complies
Average Time of Channel Occupancy	Complies

Compliance Engineering Services, Inc. tested the above equipment for compliance with the requirements set forth in CFR 47 PART 15, SUBPART C. This said equipment in the configuration described in this report shows the maximum emission levels emanating from equipment are within the compliance requirements.

STEVE CHENG/EMC ENG. MANAGER
COMPLIANCE CERTIFICATION SERVICES, INC.

DATE

Warning: This document reports conditions under which testing was conducted and results of tests performed. This document may not be altered or revised in any way unless done so by Compliance Certification Services and all revisions are duly noted in the revision section. Any alteration of this document not carried out by Compliance Certification Services will

2. DESCRIPTION OF EQUIPMENT UNDER TEST (EUT)

The product is a FHSS WLAN adapter operating in the 2.4-2.4835GHz band with a nominal TX output power of 100mW. It is an enclosed circuit board assembly with a 5-pin data/power standard USB connector attached to a 6-foot cable and an integral antenna.

3. ANTENNA CONNECTION

To comply with 15.203, the antenna is an integral part of the EUT. It is part of the printed circuit pattern on the circuit board inside the plastic case of the EUT.

4. PSEUDORANDOM HOPPING SEQUENCE

Please refer to ATTACHMENT#8: **CONFIDENTIALITY PACKAGE.**

5. CHANNEL USAGE

Please refer to ATTACHMENT#8: **CONFIDENTIALITY PACKAGE.**

6. THEORY OF OPERATION

Please refer to ATTACHMENT#8: **CONFIDENTIALITY PACKAGE.**

7. THE COORDINATION OF FREQUENCY HOPPING SYSTEM

Please refer to ATTACHMENT#8: **CONFIDENTIALITY PACKAGE.**

8. RECEIVER TECHNICAL INFORMATION

To describe system receiver input bandwidth and system receiver hopping capability
Please refer to ATTACHMENT#5: **EUT TECHNICAL DESCRIPTION** exhibit.

9. TEST LOCATION

All emissions tests were performed at:

Compliance Consulting Services
561F Monterey Road
Morgan Hill, CA 95087
Contact Person: Steve Cheng/EMC Engineering Manager

CCS has site descriptions on file with the FCC for 10 and 3 meter site configurations. CCS is a NVLAP accredited facility.

Radiated emissions from the digital portion of the EUT were performed on site A, one of the 10-meter sites.

10. SUPPORT EQUIPMENT

DEVICE TYPE	MANUFACTURER	MODEL NAME	SERIAL NO	FCC ID
LAPTOP PC	Compaq	Presario 1275	N/A	DOC
DC ADAPTER	Lap-Top	LE9702A	1V99CLR792YF	N/A

TEST EQUIPMENT

EQUIPMENT TYPE	MODEL NAME	SERIAL NO	CAL DUE:
SPECTRUM ANALYZER	HP8566B	3014A06685	06/16/01
PRE-AMP	HP8449B 1-26.5G	3008A00369	05/30/02
PRE-AMP	MITEQ 1-26G	646456	04/12/02
BILOG ANTENNA	SCHAFFNER- CHASE 30M-2G	CBL6112B	12/11/01
EMCO HORN ANTENNA	3115 1-18G	9001-2238	01/9/02
ARA HORN ANTENNA	MWH-1826 18-26G	1013	07/26/01
High Pass Filter	FYS Microwave	001	N/A
Band Pass Filter	NBP-1011	102	N/A

11. TEST PROCEDURES AND TEST RESULTS

Radiated Emissions (Restricted Bands of Operation)

Test Requirement: 15.205

Measurement Equipment Used:

HP 8593EM Spectrum Analyzer

HP8449B PRE-AMPLIFIER 1 –26.5 GHz

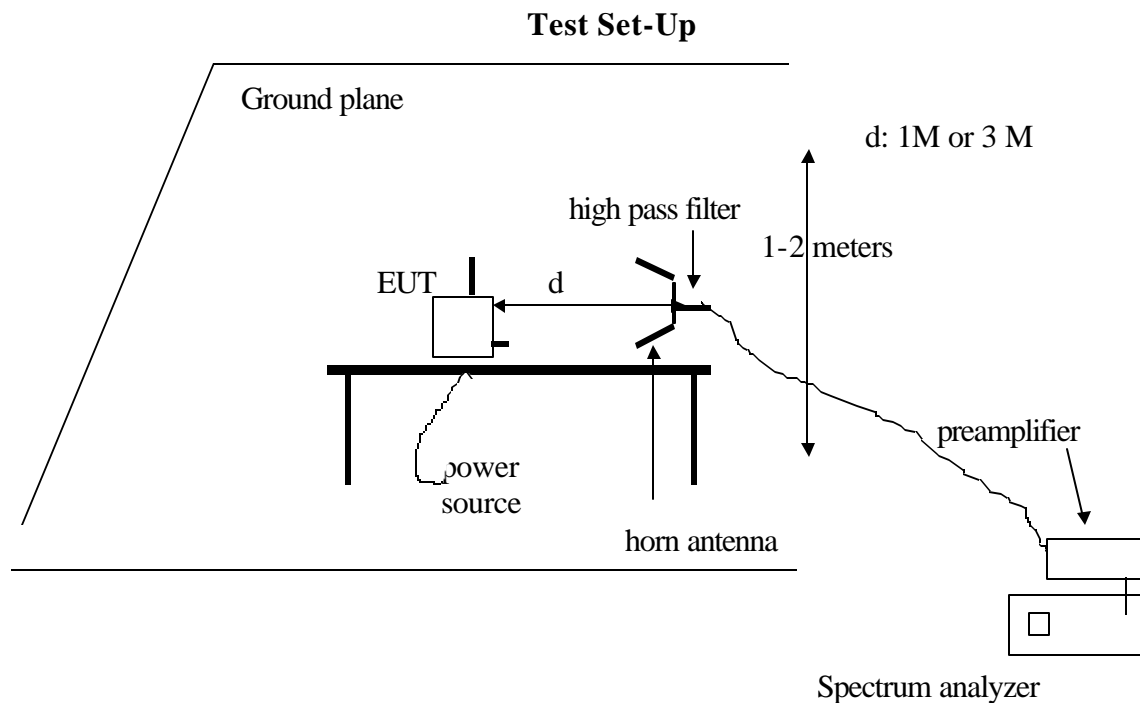
EMCO 3115 Horn Antenna, 1-18 GHz

ARA MWH1826/B Antenna, 18-26 GHz

FLEXCO Cables, 14ft (loss: 0.85 dB/ft@ 26 GHz)

FYS Microwave: High Pass Filter 4.305 GHz

NBP-1011: Band Pass Filter 4-8 GHz



Test Procedures

1. The EUT was placed on a wooden table on the outdoor ground plane. The search antenna was placed 3 M and 1 M from the EUT. Measurement distance is chosen so that the noise floor of the measurement system is at least 6dB below the specification limits. The EUT frequency hopping sequence disabled and set the EUT to transmit at its lowest channel first.

2. The turntable was slowly rotated to locate the direction of maximum emission at each emission falling in the restricted bands of 15.205.
3. Once maximum direction was determined, the search antenna was raised and lowered in both vertical and horizontal polarizations. The maximum readings so obtained are recorded in the data listed below.
4. Steps 1 to 3 were repeated for the middle and high channel
5. To ensure that the devices lowest and highest frequency of operation complies with 15.205, radiated peak and average measurements were made at the respective bandedge and plots are attached in pages 10 and 11.

Test Results:

Refer to attached spreadsheets.

PROXIM RADIATED EMISSION WITH 1dB GAIN ANT (data taken at 1m)

Frequency	SA Peak Reading (dBuV)	SA Ave Reading (dBuV)	cable loss (dB)	Filter Loss (dB)	Antenna Factor (dB)	Amp Gain (dB)	Distance Factor (dB)	Corrected 3m PK reading (dBuV)	Corrected 3m AV reading (dBuV)	Peak limit (dBuV)	Average limit (dBuV)	Peak Margin (dB)	Average Margin (dB)	
Low Channel (2402 MHz)														
4804	51.8	48	4.314	0.4	33.412	31.25	9.54	49.138	45.338	73.98	53.98	-24.844	-8.644	
7206	53.1	43.1	5.322	1	37.285	31.25	9.54	55.897	45.897	73.98	53.98	-18.083	-8.083	
9608	50.5	43.2	6.275	1	38.1	31.25	9.54	55.085	47.785	73.98	53.98	-18.895	-6.195	
12010	46.9	35.7	NF	7.004	1	39.49	31.25	9.54	53.604	42.404	73.98	53.98	-20.376	-11.576
14412	53.9	40.6	NF	8.042	1	41.212	31.25	9.54	63.364	50.064	73.98	53.98	-10.816	-3.916
Middle Channel (2440 MHz)														
4880	51	46.8	4.351	0.4	33.64	31.25	9.54	48.601	44.401	73.98	53.98	-25.379	-9.579	
7320	51.6	44.3	5.362	1	37.356	31.25	9.54	54.528	47.228	73.98	53.98	-19.452	-8.752	
9760	47.3	37.7	6.339	1	38.1	31.25	9.54	51.949	42.349	73.98	53.98	-22.031	-11.631	
12200	47.3	35.7	NF	7.084	1	39.3	31.25	9.54	53.894	42.294	73.98	53.98	-20.086	-11.686
14640	52	40.2	NF	8.154	1	40.88	31.25	9.54	61.244	49.444	73.98	53.98	-12.736	-4.536
High Channel (2480 MHz)														
4960	50.9	46.6	4.39	0.4	33.88	31.25	9.54	48.78	44.48	73.98	53.98	-25.2	-9.6	
7440	51.5	44.4	5.404	1	37.452	31.25	9.54	54.666	47.466	73.98	53.98	-19.314	-6.514	
9920	48	36.4	6.406	1	38.1	31.25	9.54	52.716	41.116	73.98	53.98	-21.264	-12.864	
12400	47.9	35.9	NF	7.168	1	39.1	31.25	9.54	54.378	42.378	73.98	53.98	-19.602	-11.602
14880	51.4	40.4	NF	8.271	1	40.16	31.25	9.54	60.041	49.041	73.98	53.98	-13.939	-4.939

NF: Measured noise floor
 DISTANCE FACTOR: 1M to 3M measurement distance: -9.5dB
 Correction to extrapolate reading to 3m specification distance

INSTRUMENT USED

ANTENNA: EMCO, 3115, S/N 2238 & ARA, MVH-1826/B, S/N 1013
 SPECTRUM ANALYZER: HP8593EM, S/N 3710A00205
 PRE-AMP: MITEQ, NSP2600-44, S/N 646456
 PRE-AMP: HP8449B, S/N 3008A00369
 CL: Cable loss (15ft)
 HPF: High pass filter insertion loss (4.6GHz) FSY (S/N: 001)

ANALYZER SETTINGS
 Res BW: 1MHz
 Avg BW: 10Hz
 PEAK(PK):
 AVERAGE(Avg):

CORRECTED FIELD STRENGTH = SA reading +Cable Loss+ Filter Loss +Ant Factor - Amp Gain - (1 to 3 m conversion factor)
 LIMIT: 500 uV = 20 x log 500 = 53.98 dBuV

NOTE: MEASURED HORIZONTAL (H) AND VERTICAL (V) (worse case vertical)

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COMPLIANCE CERTIFICATION SERVICES, INC. DOCUMENT NO:CCSUP4025B
 561 F. Monterey, Rd. Route 2 Morgan Hill, CA. TEL: (408)463-0885 FAX:(408)463-0888
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Radiated Emissions

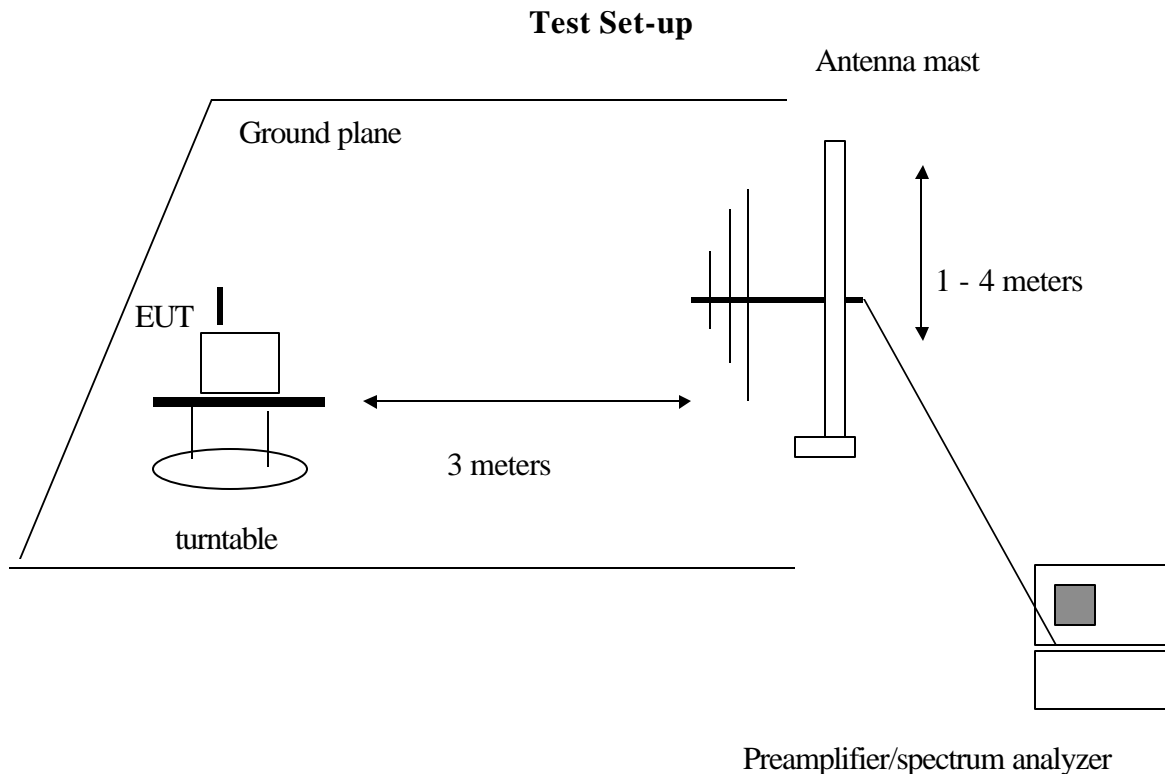
Test Requirement: 15.209

Measurement Equipment Used:

HP 8566B Spectrum Analyzer

SCHAFFNER-CHASE BILOG Antenna, 30 - 2 GHz

HP 8447D Amplifier




TEST PROCEDURE:

The EUT was placed on a turntable at a distance of 3 meters from a BILOG search antenna. The unit was set to transmit while hopping normally. The antenna was raised and lowered, the EUT rotated on the turntable, until the EUT azimuth, antenna elevation, and antenna polarity were found which yielded maximum received emission levels on the spectrum analyzer.

Test Result:

Refer to attached tabular data sheet.

		Project #: <u>01U0853-1</u>	
		Report #: <u>010619A1</u>	
FCC, VCCI, CISPR, CE, AUSTEL, NZ UL, CSA, TUV, BSMI, DHHS, NVLAP 561F MONTEREY ROAD, SAN JOSE, CA 95037-9001 PHONE: (408) 463-0885 FAX: (408) 463-0888		Date & Time: <u>06/19/01 11:58 AM</u>	
		Test Engr: <u>JESSE SALDIVAR</u>	
Company: <u>PROXIM, INC.</u>		EUT Description: <u>WIRELESS LAN BRIDGE 2.4GHz FHSS</u>	
Test Configuration: <u>SYMPHONY HOME RF USB ADAPTER 4240</u>		Type of Test: <u>FCC CLASS B</u>	
Mode of Operation: <u>NORMAL HOPPING MODE</u>		<input data-bbox="1084 695 1240 753" type="button" value=" << Main Sheet "/>	

Freq. (MHz)	Reading (dBuV)	AF (dB)	Cross (dB)	Pre-amp (dB)	Level (dBuV/m)	Limit FCC_B	Margin (dB)	Pol (H/V)	Az (Deg)	Height (Meter)	Mark (P/Q/A)
480.00	43.30	18.24	3.18	28.45	36.27	46.00	-9.73	3mV	180.00	1.00	P
480.00	41.20	18.24	3.18	28.45	34.17	46.00	-11.83	3mH	180.00	1.50	P
384.00	41.00	16.51	2.76	27.85	32.42	46.00	-13.58	3mH	180.00	1.50	P
384.00	39.80	16.51	2.76	27.85	31.22	46.00	-14.78	3mV	180.00	1.00	P
144.00	42.50	12.18	1.60	27.65	28.64	43.50	-14.86	3mV	270.00	1.00	P
144.00	42.20	12.18	1.60	27.65	28.34	43.50	-15.16	3mH	180.00	1.00	P
6 Worst Data											

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AC Line Conducted Emissions

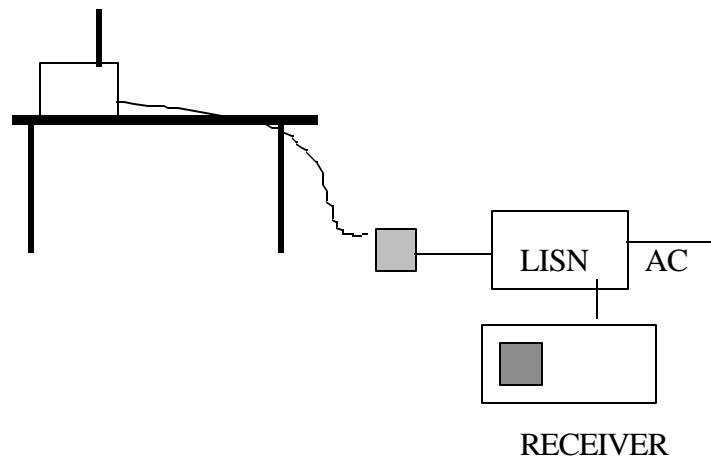
Test Requirement: 15.207

Measurement Equipment Used:

Rhode & Schwarz EMI Receiver ESHS-20

Fischer Custom Communication LISN, FCC-LISN-50/250-25-2

Test Set-up



Test Procedure

1. The EUT was placed on a wooden table 40 cm from a vertical ground plane and approximately 80 cm above the horizontal ground plane on the floor. The unit was set to transmit while hopping normally.
2. Line conducted data was recorded for both NEUTRAL and HOT lines.

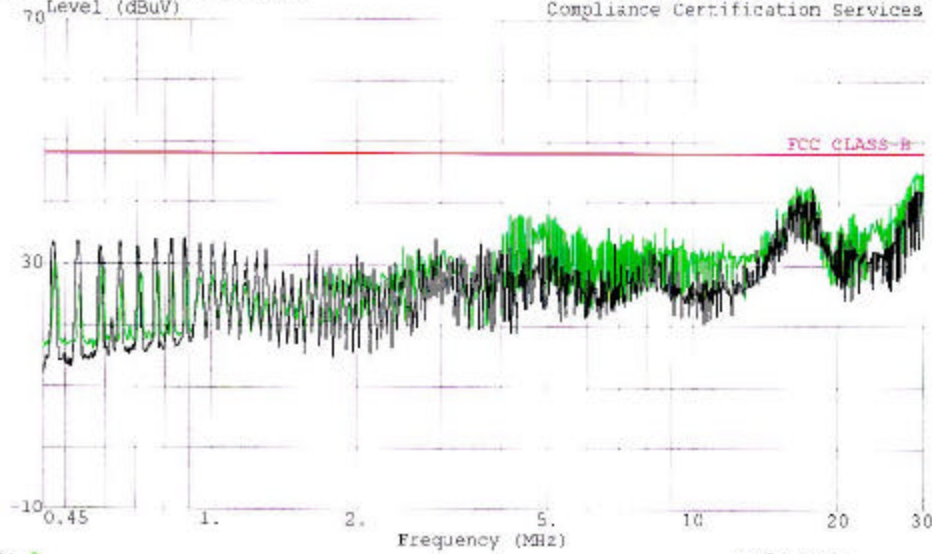
Test Results

Refer to attached graph.



561 F Monterey Road, Route 2
 Morgan Hill, CA 95037-9001 USA
 Tel: (408) 463-0885
 Fax: (408) 463-0888

Data#: 7 File#: 01U0853.RMI Date: 06-19-2001 Time: 11:40:07
 Level (dBuV) Compliance Certification Services



Trace: 3
 Project No. : 01U0853-1
 Report No. : 010619LC
 Test Engr : Jesse Saldivar
 Company : Proxim, Inc.
 EUT Description : Wireless LAN Bridge 2.4GHz FHSS
 Model :
 EUT Config. : EUT/Laptop Host/Printer/Modem
 Type of Test : FCC Class B
 Mode of Operation: Operational Mode
 : PEAK: L1 {Green}, L2 {Black}
 : 115Vac, 60Hz

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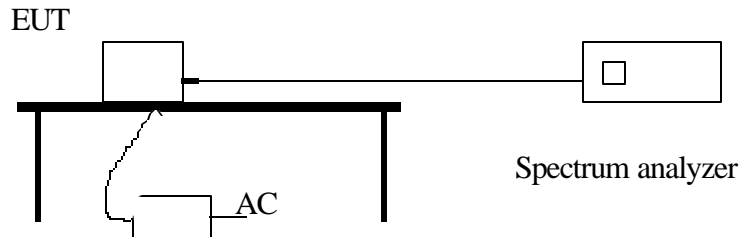
Conducted Emission

Test Requirement: 15.247(c)

Measurement Equipment Used:

HP 8566B Spectrum Analyzer

Test Set-up



Test Procedure:

The RF output port of the EUT was connected to the spectrum analyzer through a 6 inch RG-316 cable. Total path loss including cable and attenuator at 2.4-2.5 GHz was 10.2dB.

The EUT was configured on a test bench as shown above. The EUT was set to transmit while hopping normally. The spectrum analyzer was placed in MAX Hold mode, and individual sweeps were recorded with spectrum analyzer RES BW and VID BW set to 100KHz. The first plot shows spectrum analyzer START FREQUENCY set to 30 MHz and STOP FREQUENCY set to 2.5GHz. The second plot shows spectrum analyzer START FREQUENCY set to 2.0GHz and STOP FREQUENCY set to 2.68GHz. The third plot shows spectrum analyzer START FREQUENCY set to 2.6GHz and STOP FREQUENCY set to 22GHz. All emissions were compared to the 20-dB attenuation requirement.

Test Result:

Please refer to attached plots.

SPURIOUS RF CONDUCTED EMISSIONS
REF 30.2 dBm ATTEN 30 dB

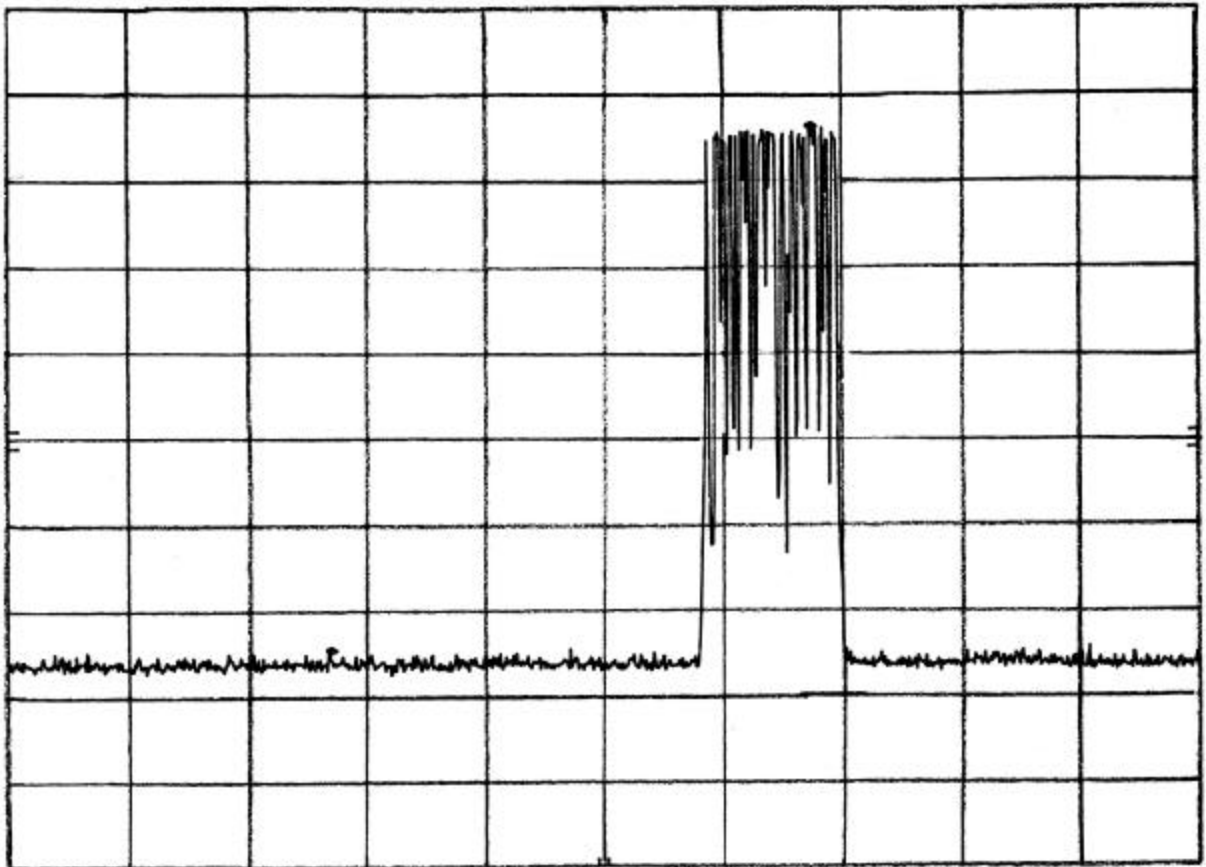
MKR Δ -274.0 MHz
-61.00 dB

hp

10 dB/

POS PK

OFFSET
10.2
dB



START 2.000 GHz

RES BW 100 kHz

VBW 100 kHz

STOP 2.680 GHz
SWP 204 msec

SPURIOUS RF CONDUCTED EMISSIONS
REF 30.2 dBm ATTEN 30 dB

MKR Δ -620 MHz
-62.00 dB

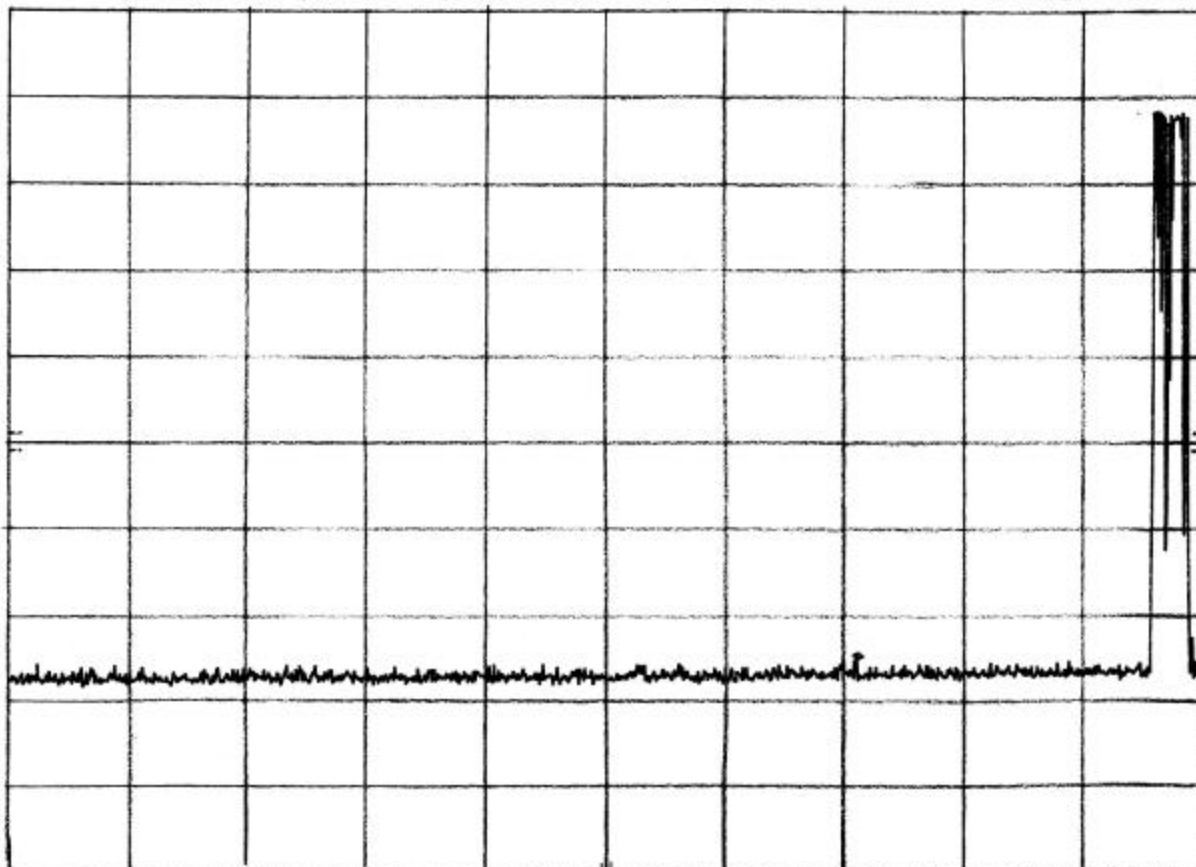
hp

10 dB/

POS PK

OFFSET

10.2
dB



START 30 MHz

RES BW 100 kHz

VBW 100 kHz

STOP 2.50 GHz
SWP 741 msec

SPURIOUS RF CONDUCTED EMISSIONS

MKA 20.14 GHz
-31.60 dBm

1/2

REF 30.2 dBm ATTEN 30 dB

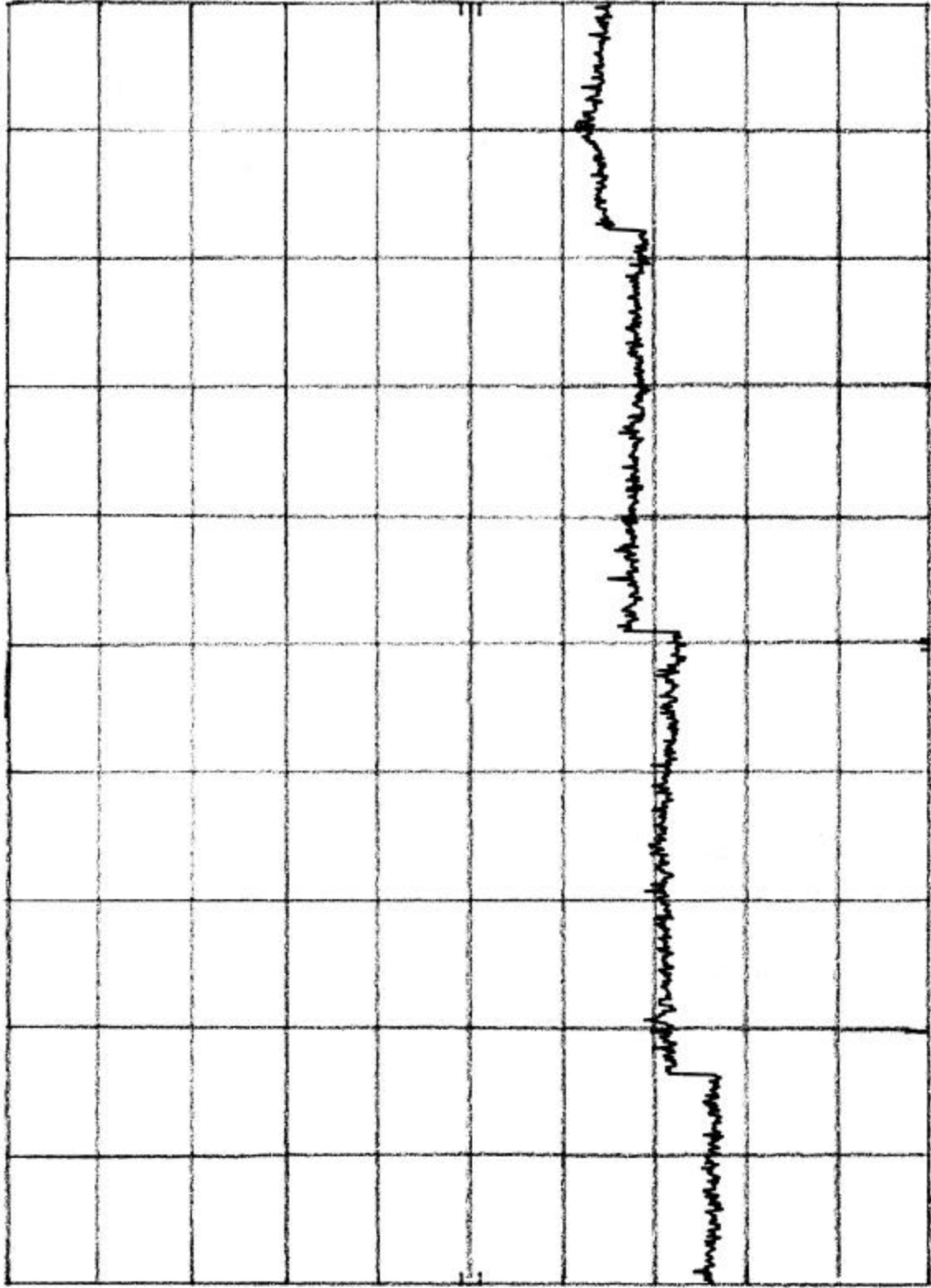
10 dB/

POS PK

OFFSET

10.2

dB



START 2.6 GHz

RES BW 100 KHz

VBW 100 KHz

STOP 22.0 GHz

SWP 5.02 sec

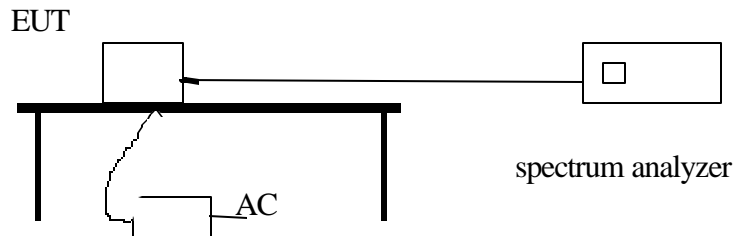
BAND-EDGE

Test Requirement: 15.247(c)

Measurement Equipment Used:

HP 8566B Spectrum Analyzer

Test Set-up



Test Procedure:

The RF output port of the EUT was connected to the spectrum analyzer through a 6 inch RG-316 cable. Total path loss including cable and attenuator at 2.4-2.5 GHz was 10.2dB.

The EUT was configured on a test bench as shown above. The EUT was made to transmit uninterrupted random data on the low and high channel.

Spectrum analyzer CENTER FREQUENCY set to Low Channel (2402 MHz). SPAN set to 30MHz. RES BW and VIDEO BW both set to 300KHz. The spectrum analyzer was put into MAX HOLD mode. Using the delta marker function, the delta between the signal level at Low Channel and the signal level at 2400MHz was determined.

The above steps were repeated for HIGH Channel (2480 MHz) with delta markers set to High Channel (2480 MHz) and 2483.5 MHz.

To ensure that EUT will continue compliance with the Band-edge emission in normal hoping mode operation; the EUT was put back to the normal working condition (i.e. hoping mode enabled). And test repeated again.

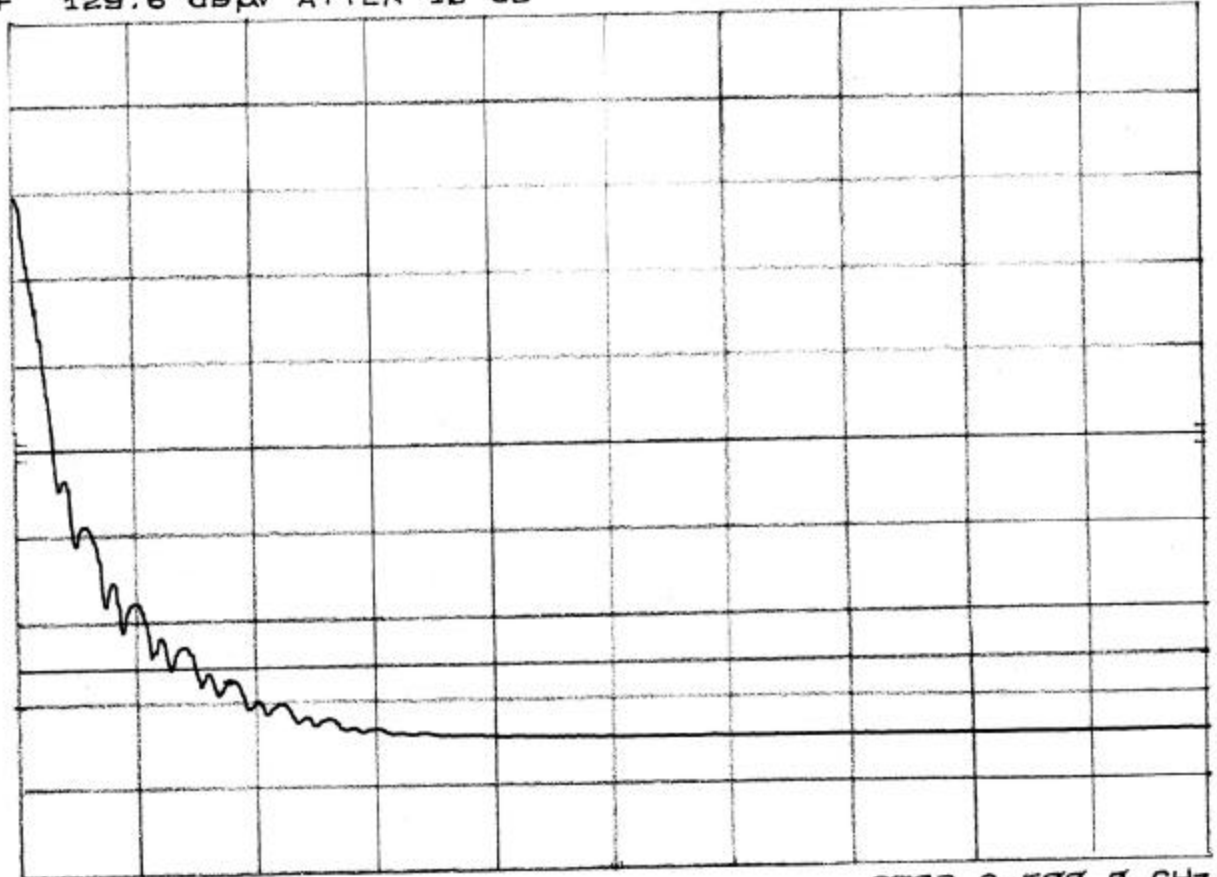
Test Result:

Please refer to attached plots.

HIGH CH BANDEDGE
REF 129.6 dB μ V ATTN 10 dB

MKR 2.483 50 GHz
52.30 dB μ V

hp
10 dB/
POS PK
OFFSET
22.6
dB
DL
54.0
dB μ V



START 2.4800 GHz
RES BW 100 kHz

VBW 10 Hz

STOP 2.5000 GHz
SWP 60.0 sec

HIGH CH BANDEDGE

REF 129.6 dBμV ATTEN 10 dB

MKR 2.483 50 GHz
63.20 dBμV

hp

10 dB/

POS PK

OFFSET

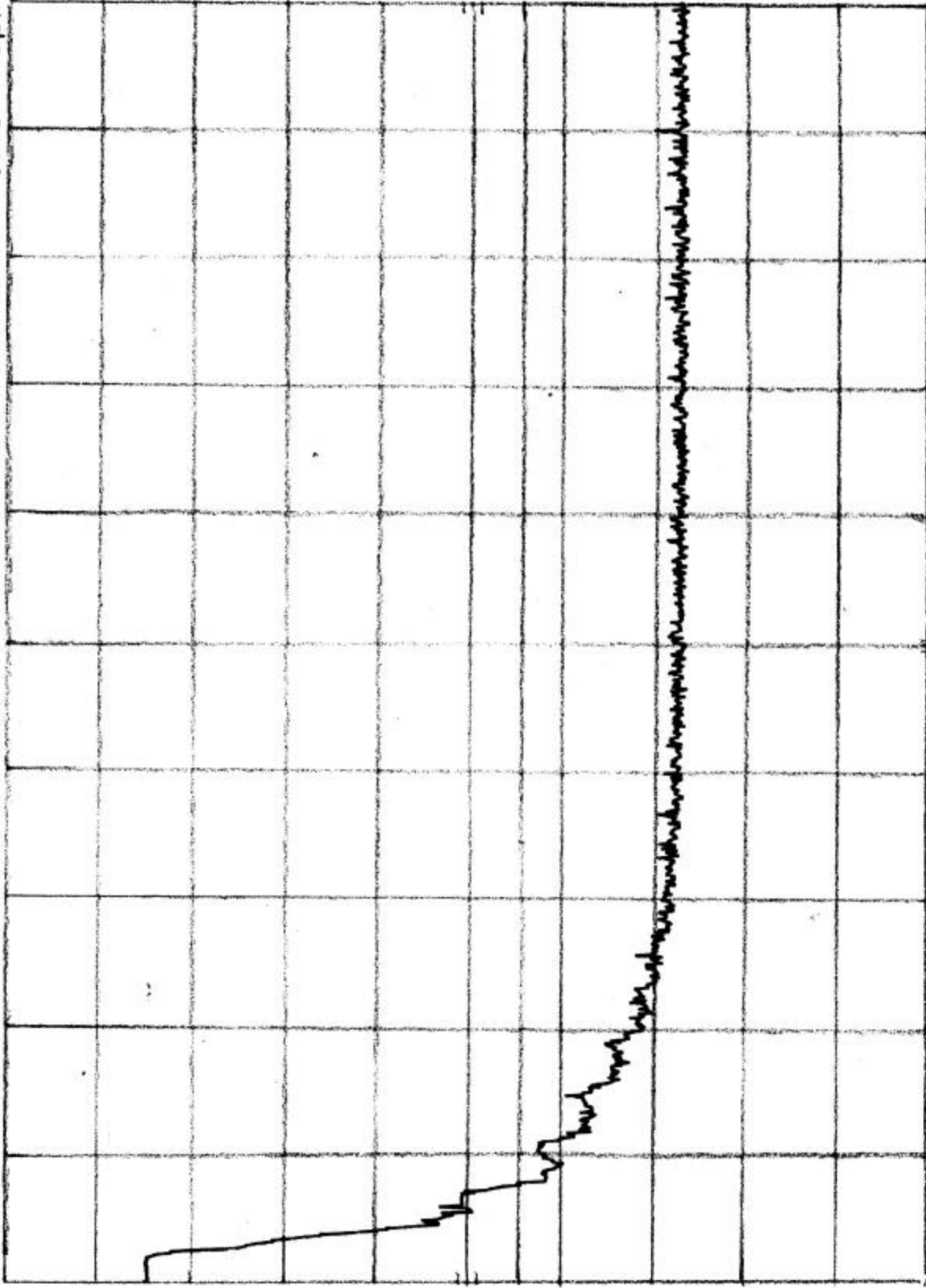
22.6

dB

DL

74.0

dBμV



START 2.480 0 GHz

RES BW 100 KHz

VBW 1 MHz

STOP 2.500 0 GHz

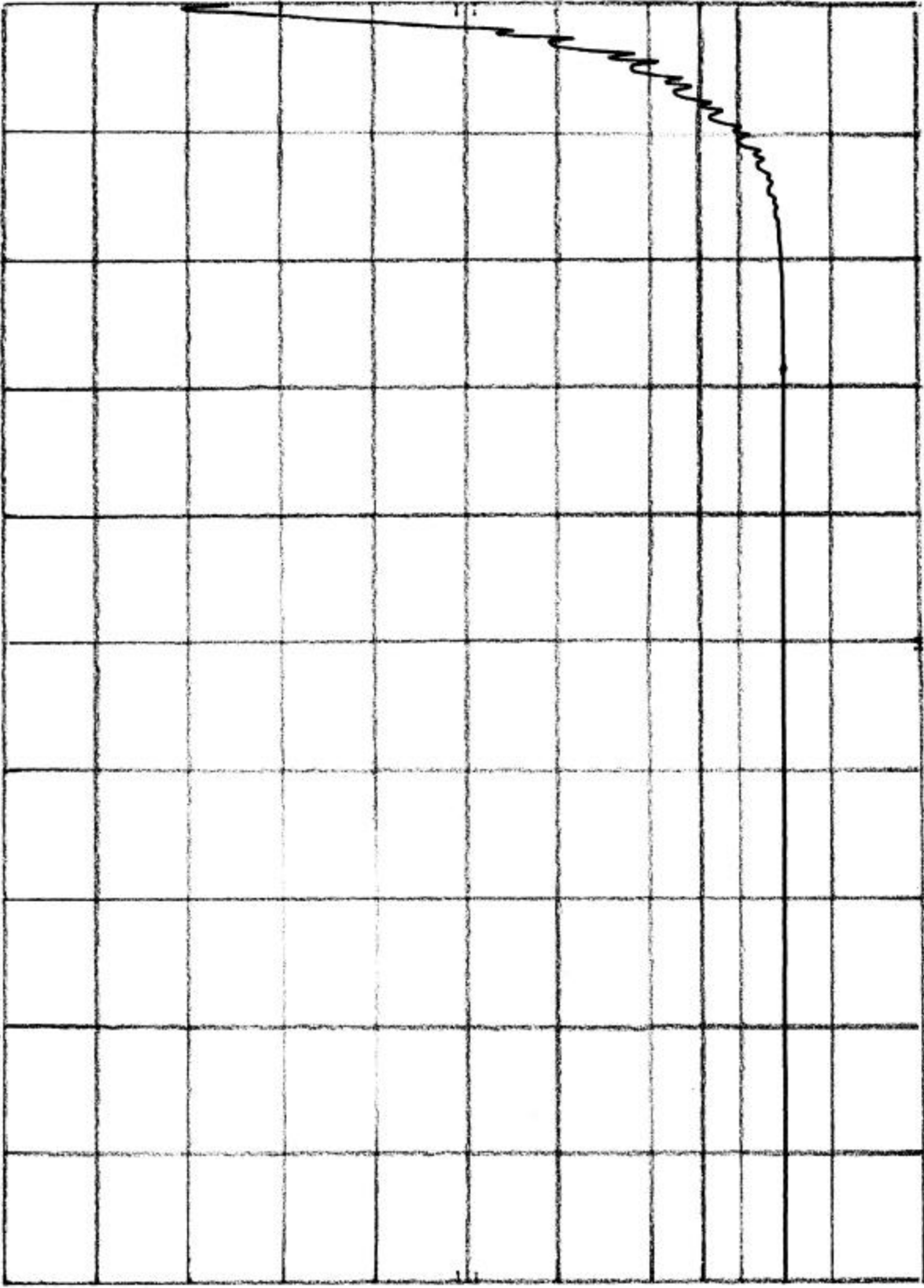
SWP 20.0 msec

MKR 2.369 98 GHz
44.90 dB μ V

LOW CH BANDEDGE
REF 129.6 dB μ V ATTEN 10 dB

h₁₀

10 dB/
POS PK
OFFSET
22.6
dB
DL
54.0
dB μ V



STOP 2.402 0 GHz
SWP 125 sec

VBW 10 Hz

RES BW 100 KHZ

START 2.360 0 GHz

LOW CH BANDEDGE

REF 129.6 dBµV ATTEN 10 dB

MKR 2.389 99 GHz
55.80 dBµV

70

10 dB/

POS PK

OFFSET

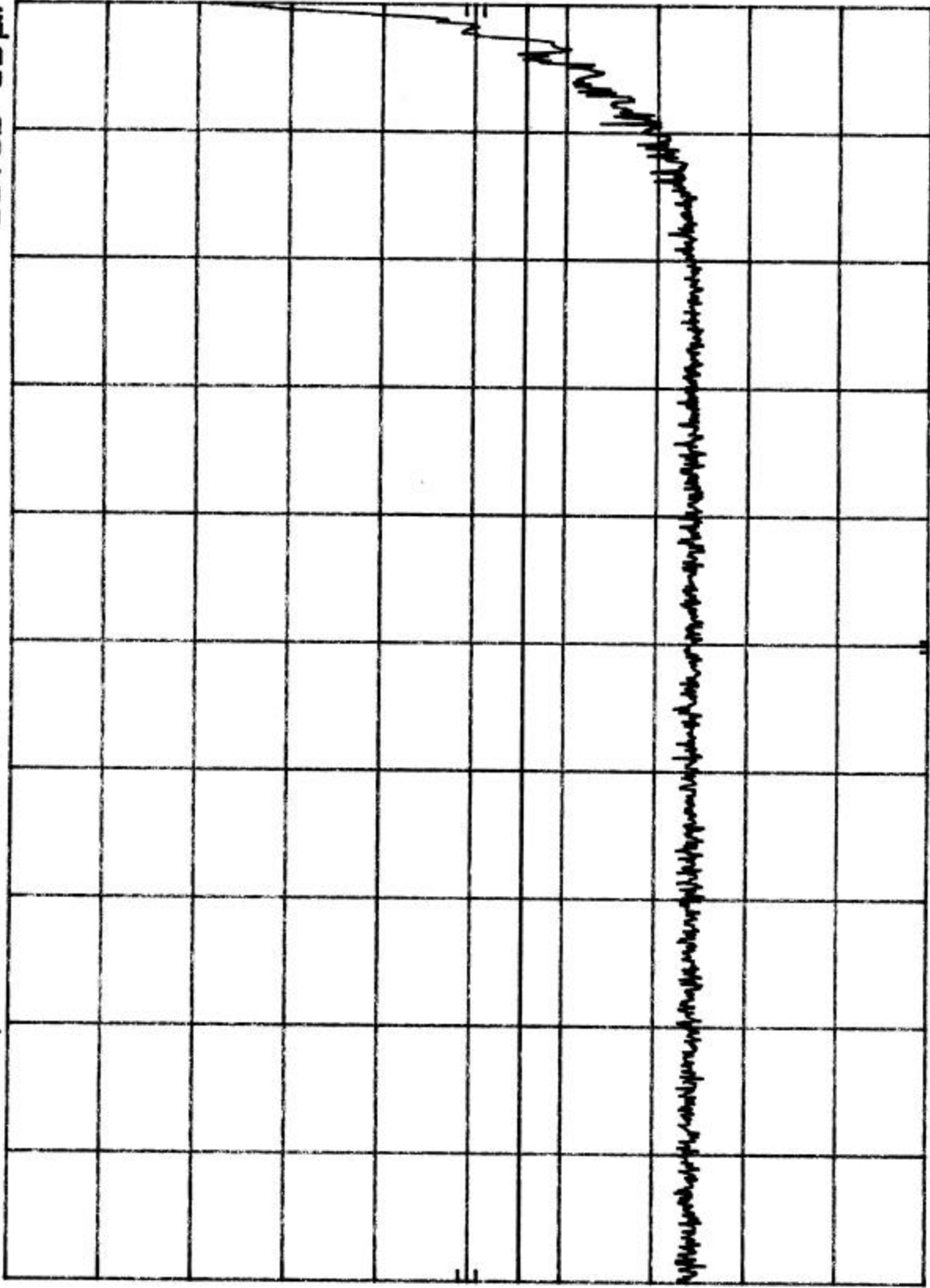
22.6

dB

DL

74.0

dBµV



START 2.360 0 GHz

RES BW 100 kHz

VBW 1 MHz

STOP 2.402 0 GHz

SWP 20.0 msec

LOW BANDEDGE WITH HOPPING ENABLED
REF 30.2 dBm ATTEN 30 dB

MKR Δ-6.96 MHz
-42.70 dB

hp

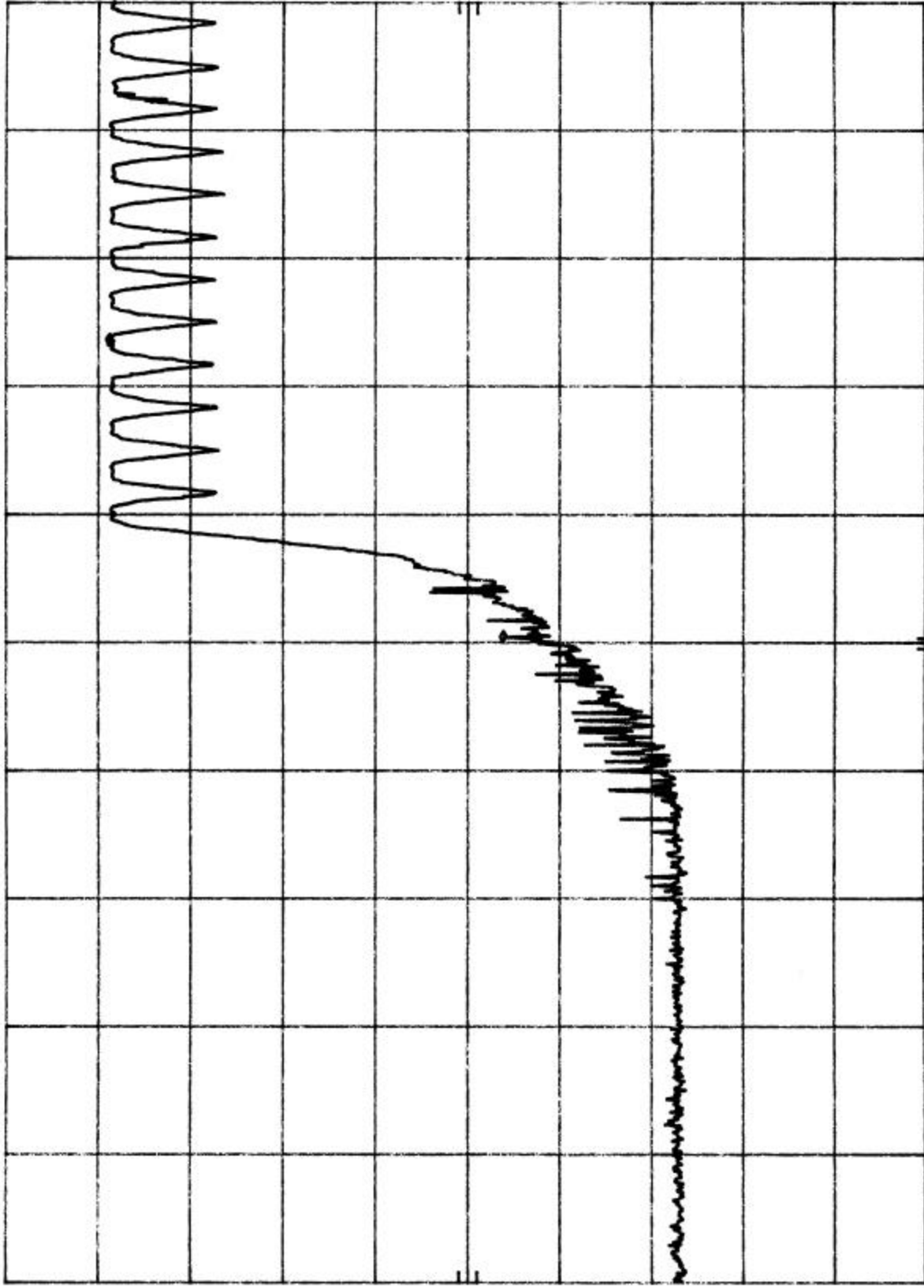
10 dB/

POS PK

OFFSET

10.2

dB



CENTER 2.400 0 GHz
RES BW 300 KHZ

VBW 300 KHZ

SPAN 30.0 MHz
SWP 20.0 msec

HIGH BANDEDGE WITH HOPPING ENABLED

MKR Δ 14.19 MHz

REF 30.2 dBm ATTEN 30 dB

-59.80 dB

hp

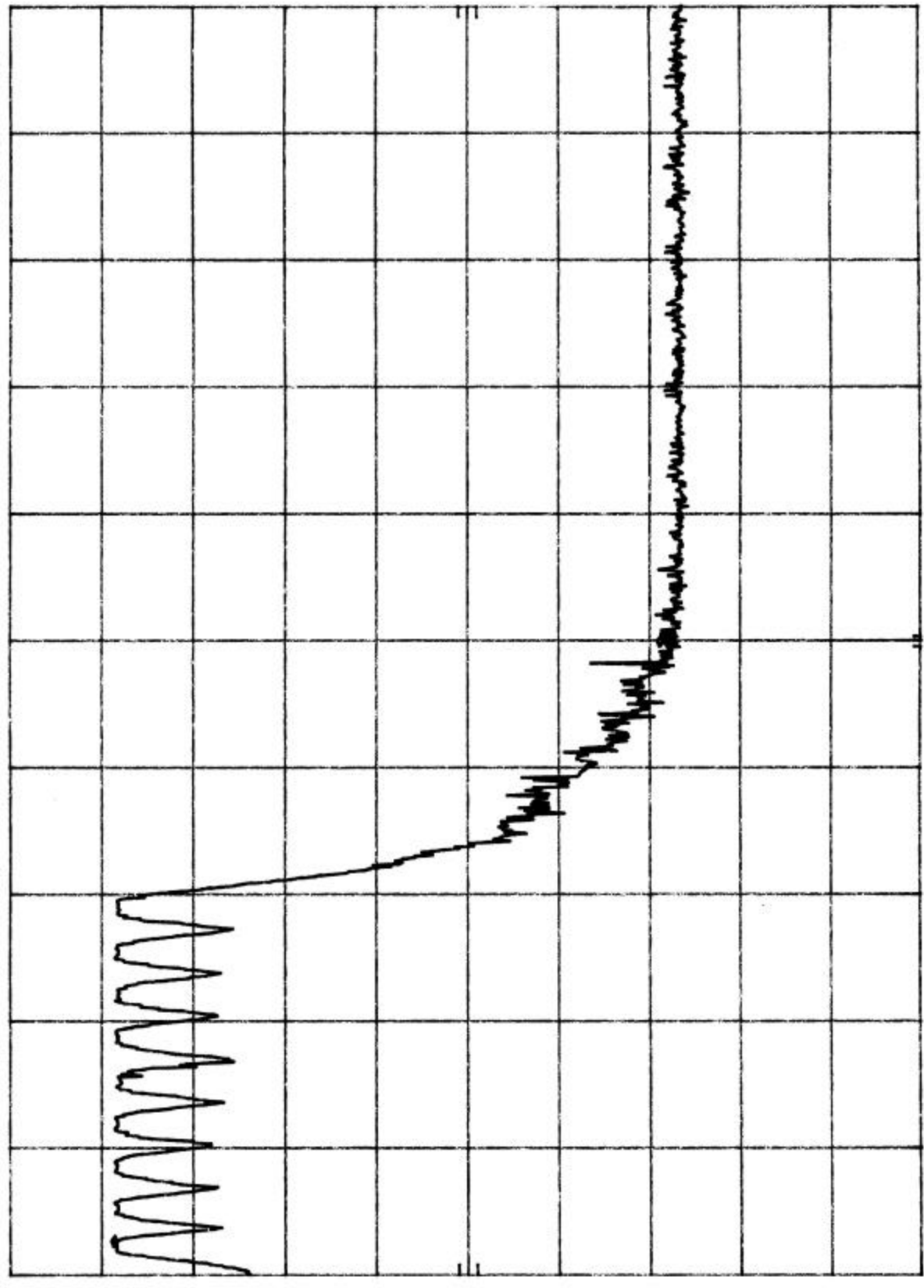
10 dB/

POS PK

OFFSET

10.2

dB



CENTER 2.483 5 GHz

RES BW 300 KHz

VBW 300 KHz

SPAN 30.0 MHz

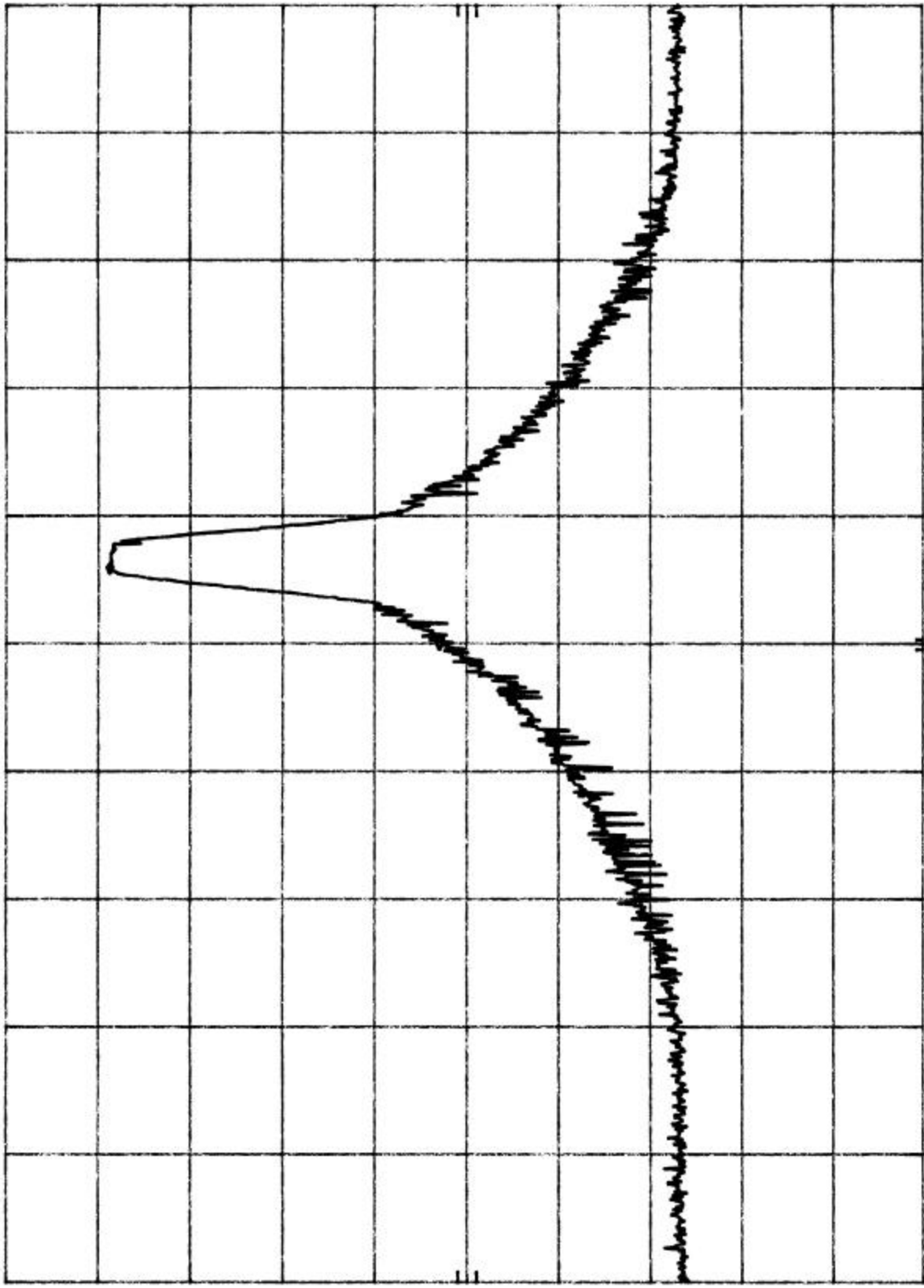
SWP 20.0 msec

LOW BANDEDGE WITH HOPPING DISABLED
REF 30.2 dBm ATTEN 30 dB

MKR Δ -1.80 MHz
-35.80 dB

hp

10 dB/
POS PK
OFFSET
10.2
dB



CENTER 2.400 GHz
RES BW 300 KHZ

VBW 300 KHZ

SPAN 30.0 MHz
SWP 20.0 msec

HIGH BANDEDGE WITH HOPPING DISABLED
REF 30.2 dBm ATTEN 30 dB

MKR Δ 3.24 MHz
-48.50 dB

hp

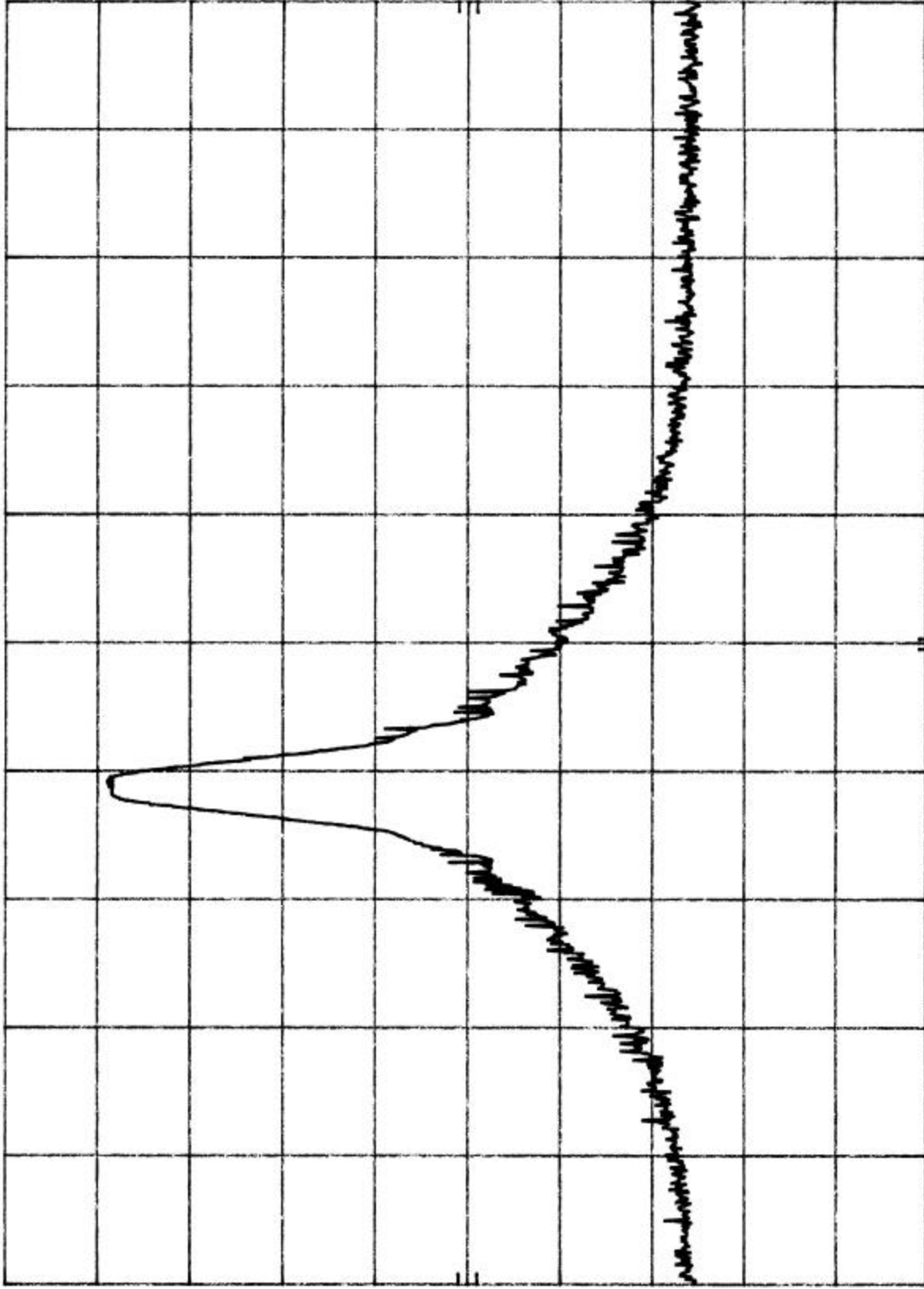
10 dB/

POS PK

OFFSET

10.2

dB



CENTER 2.483 5 GHz
RES BW 300 KHZ

VBW 300 KHZ

SPAN 30.0 MHz
SWP 20.0 msec

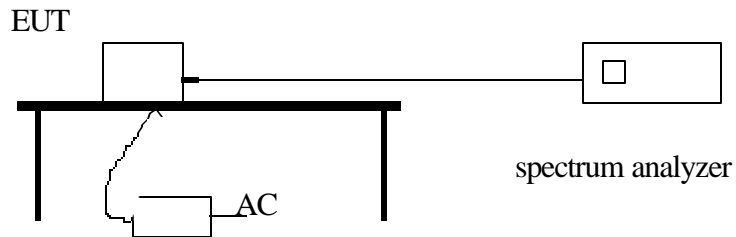
20dB Bandwidth for FHSS

Test Requirement: 15.247(a)1(ii)

Measurement Equipment Used:

HP 8566B Spectrum Analyzer

Test Set-up



Test Procedure:

The RF output port of the EUT was connected to the spectrum analyzer through a 6 inch RG-316 cable. Total path loss including cable and attenuator at 2.4-2.5 GHz was 10.2dB.

The EUT was configured on a test bench as shown above. The EUT was made to transmit uninterrupted random data on each of the low/mid/high channels. Spectrum analyzer CENTER FREQUENCY set to Low Channel (2402 MHz). SPAN set to 3 MHz. RES BW=30 kHz. The above steps were repeated for MID Channel (2440 MHz) and HIGH Channel (2480 MHz).

The low/mid/high channels for high rate mode are 2405, 2440, and 2475 MHz. Spectrum analyzer SPAN set to 20 MHz and RES BW=VID BW=30 kHz.

Test Results: Refer to attached spectrum analyzer data chart and plots.

20dB BW HIGH CH LOW RATE
REF 30.2 dBm ATTEN 30 dB
MKR Δ 935 KHZ
0.10 dB

hp

10 dB/

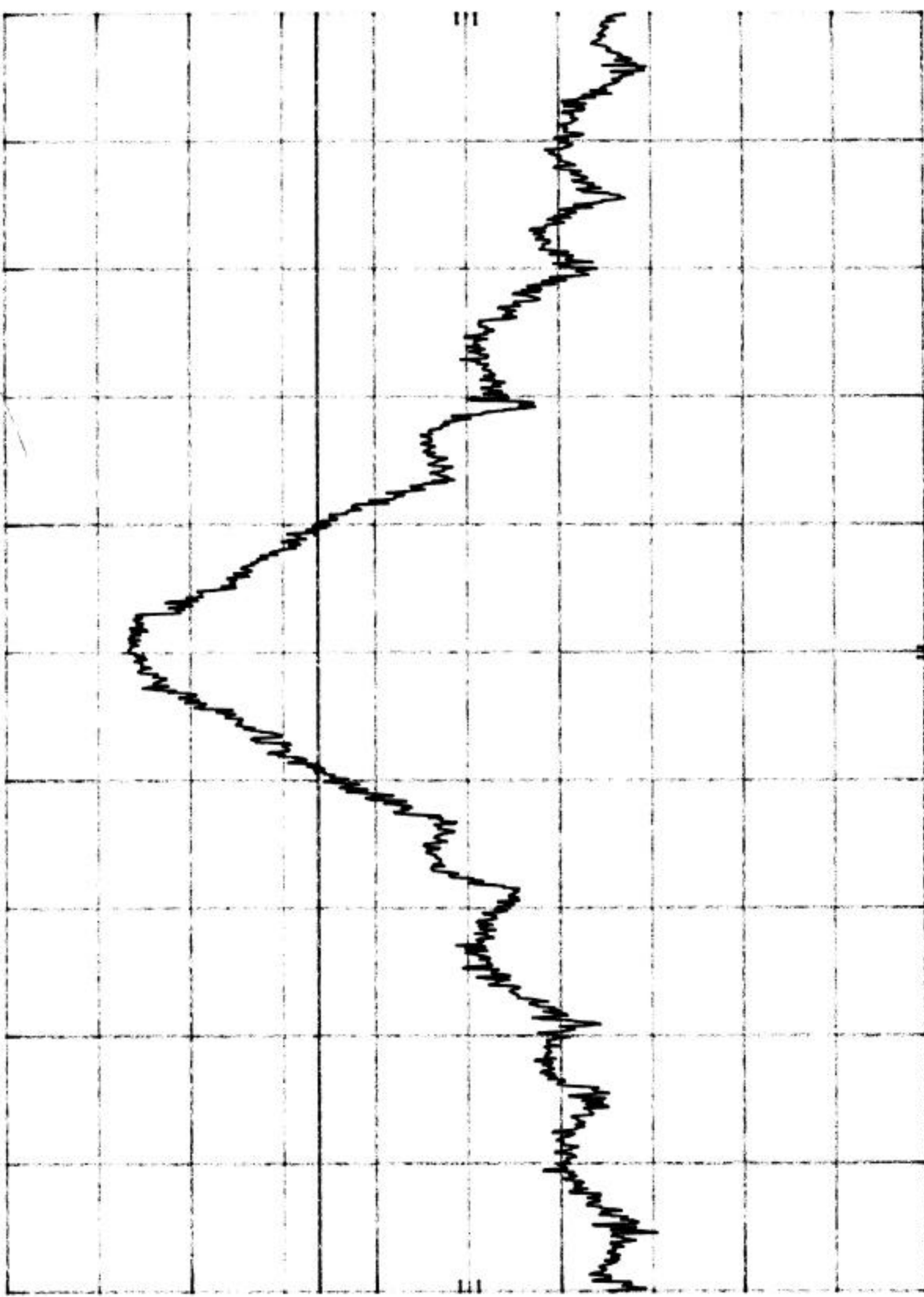
POS PK

OFFSET

10.2
dB

DL

-3.7
dBm



CENTER 2.480 00 GHZ
RES BW 30 KHZ

VBW 30 KHZ

SPAN 5.00 MHZ
SWP 20.0 msec

MKR Δ 940 KHZ
-0.50 dB

20dB BW MID CH LOW RATE
REF 30.2 dBm ATTEN 30 dB

hp

10 dB/

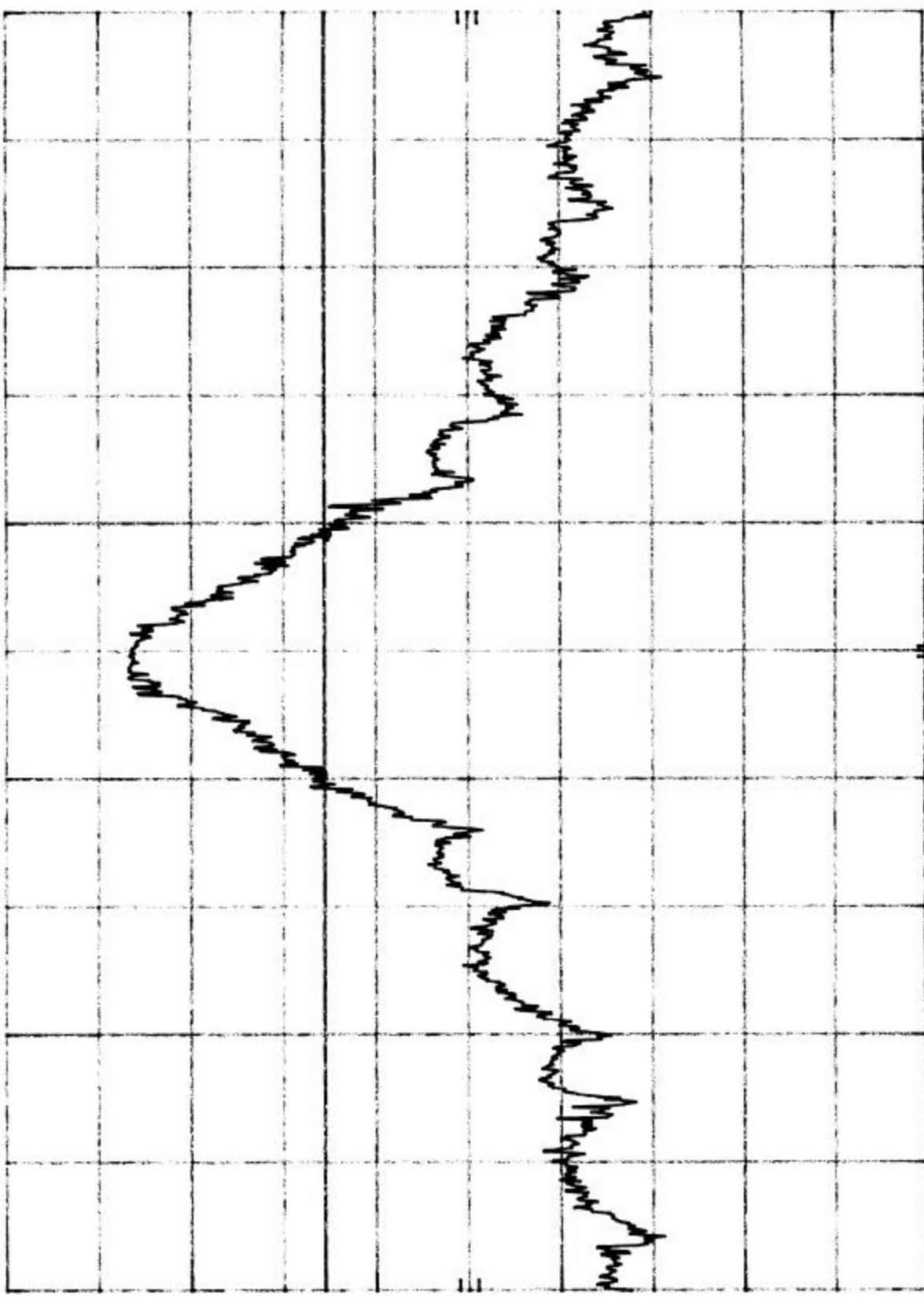
POS PK

OFFSET

10.2
dB

DL

-4.3
dBm



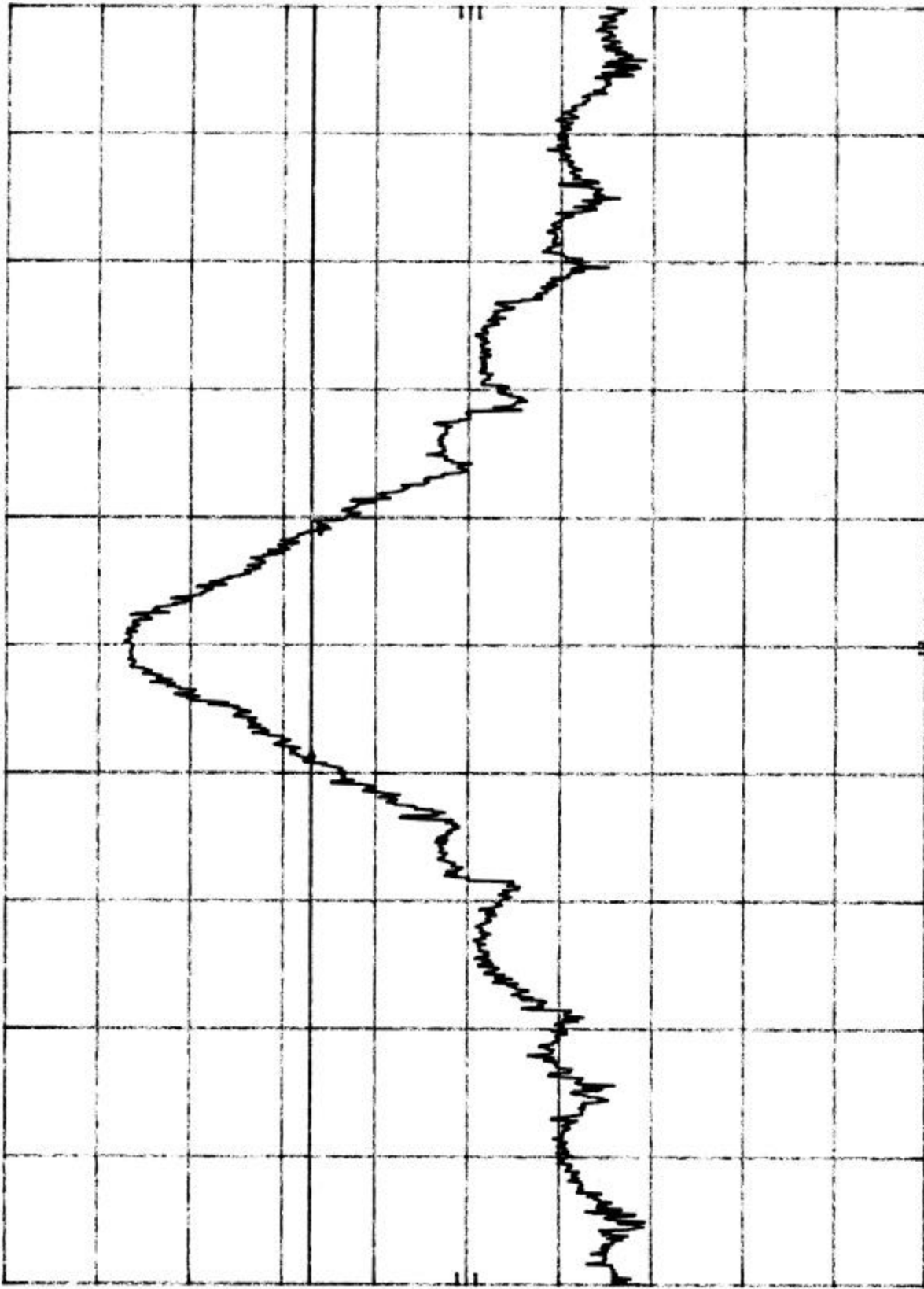
CENTER 2.440 00 GHZ
RES BW 30 KHZ

VBW 30 KHZ

SPAN 5.00 MHZ
SWP 20.0 msec

20dB BW LOW CH LOW RATE
REF 30.2 dBm ATTEN 30 dB

MKR Δ 895 KHZ
-0.90 dB



1B/
PK
SET
.2
DL
.9
3m

FER 2.402 00 GHZ
RES BW 30 KHZ
VBW 30 KHZ
SPAN 5.00 MHz
SWP 20.0 msec

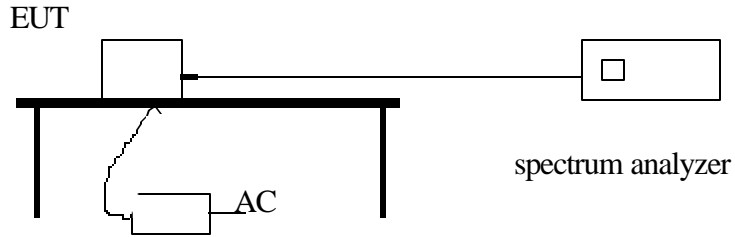
RF Power Output

Test Requirement: 15.247(b)

Measurement Equipment Used:

HP 8566B Spectrum Analyzer

Test Set-up



Test Procedure

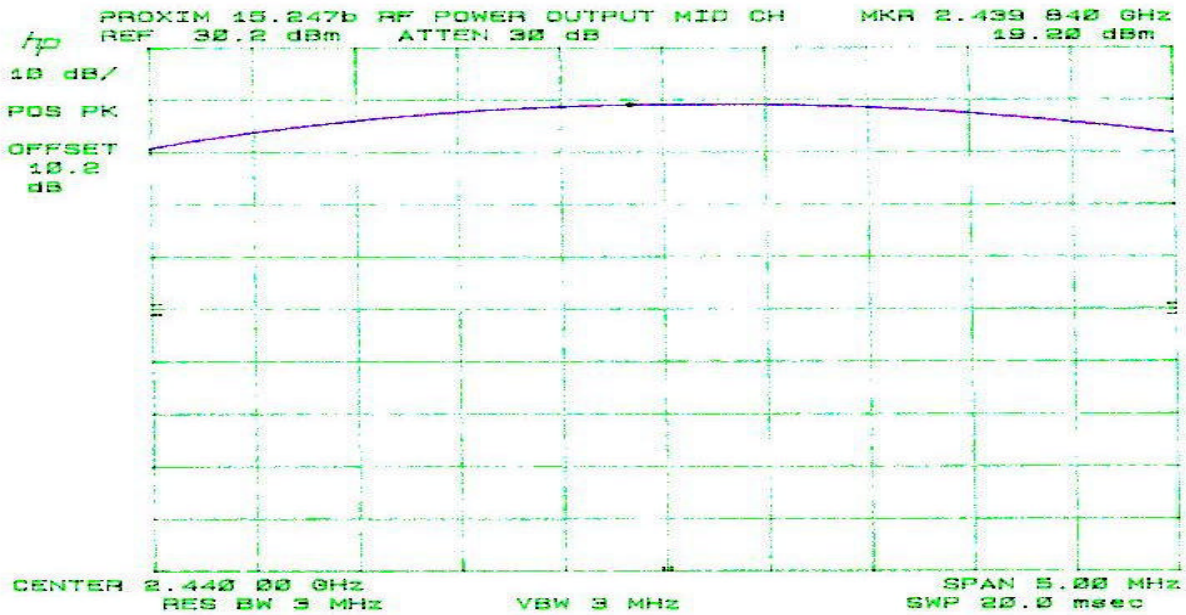
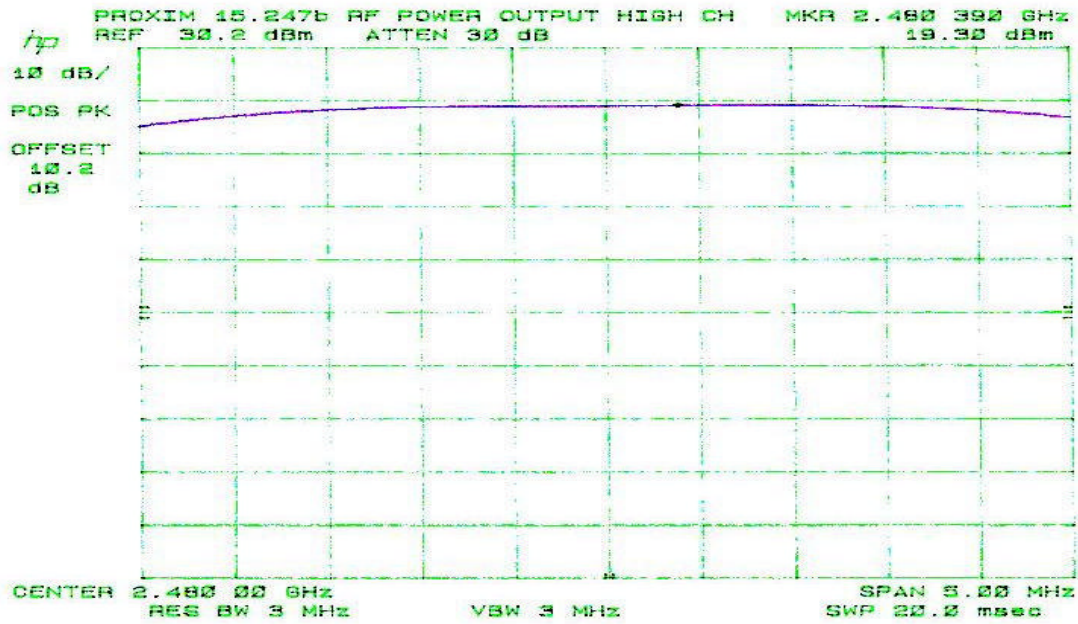
The RF output port of the EUT was connected to the spectrum analyzer through a 6 inch RG-316 cable. Total path loss including cable and attenuator at 2.4-2.5 GHz was 10.2dB.

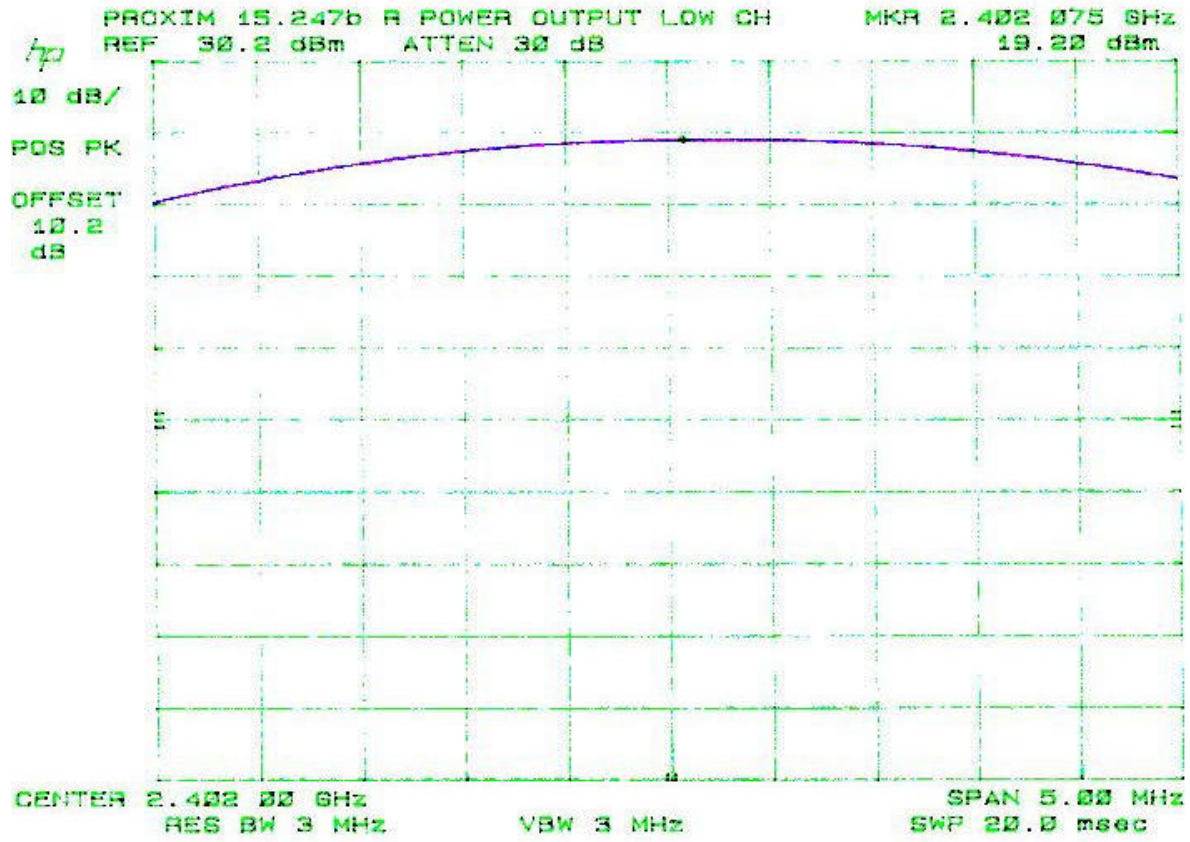
The EUT was configured on a test bench as shown above. The EUT was made to transmit uninterrupted random data on each of the low/mid/high channels. Spectrum analyzer CENTER FREQUENCY set to Low Channel (2402MHz). SPAN set to 3 MHz. RES BW=1Mz and VID BW=1MHz. The above steps were repeated for MID Channel (2440 MHz) and High Channel (2480 MHz).

Test Results:

CHANNEL	dBm	Watts	LIMIT (W)	LIMIT (dBm)	RESULT
2402MHz	19.20	0.083	1	30	COMPLIES
2440MHz	19.20	0.083	1	30	COMPLIES
2480MHz	19.30	0.085	1	30	COMPLIES

Refer to attached spectrum plots.





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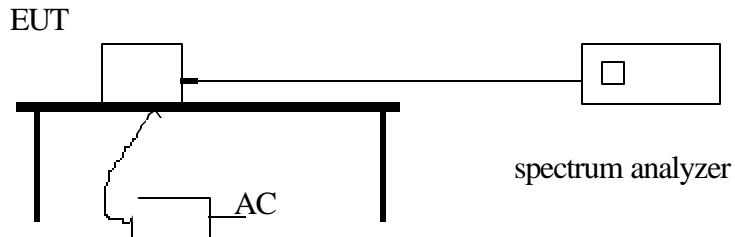
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Minimum Number of Hopping Channel

Test Requirement: 15.247(a)1(ii)

Measurement Equipment Used:
 HP 8566B Spectrum Analyzer

Test Set-up



Test Procedure:

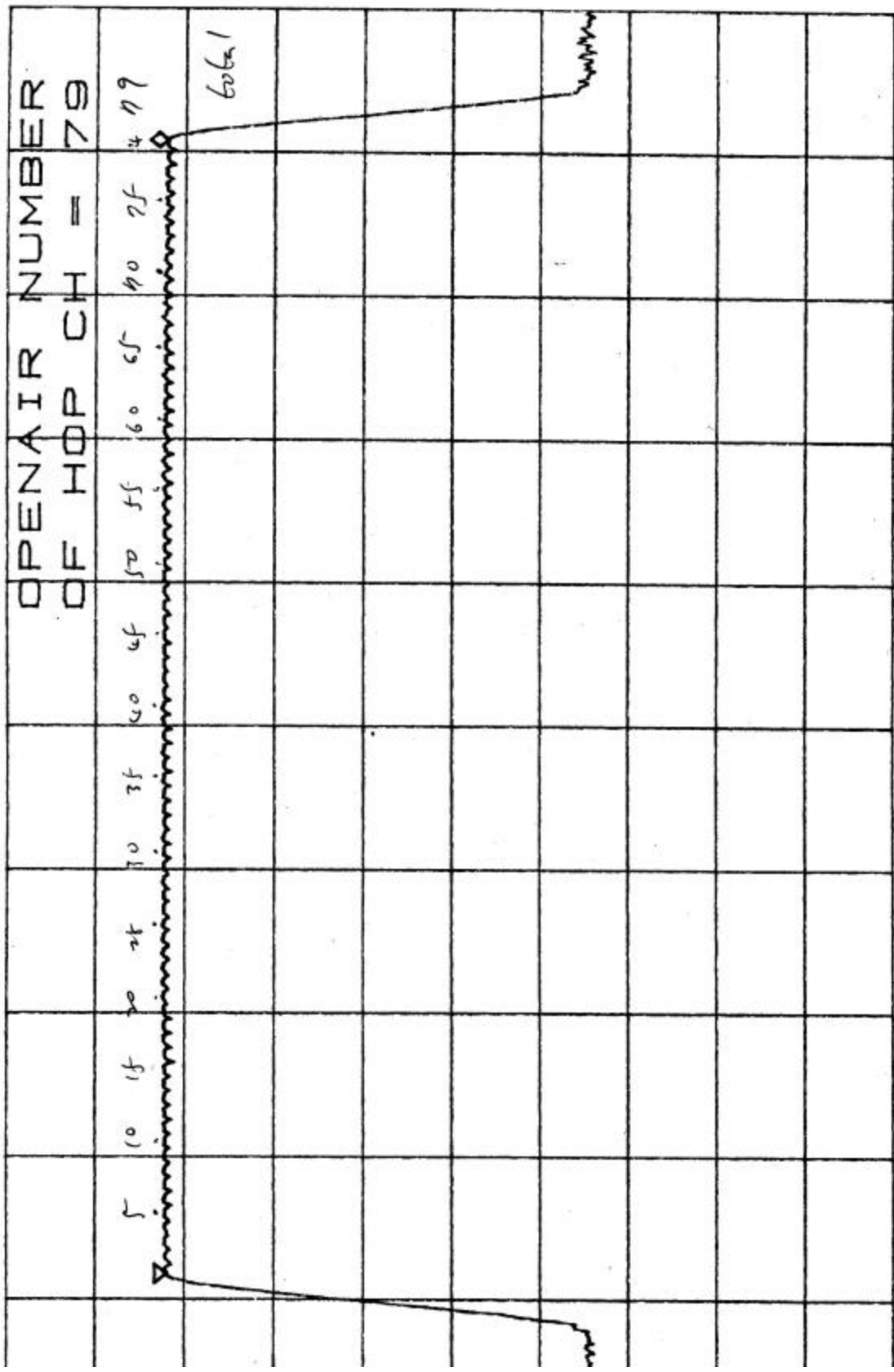
1. The RF output port of the EUT was connected to the spectrum analyzer through a 6 inch RG-316 cable. Total path loss including cable and attenuator at 2.4-2.5 GHz was 10.2dB.
2. Turn on the transmitter in normal hopping mode. The emissions will “paint” the spectrum analyzer screen with individual traces from each transmit channel. Allow the transmitter to run for at least 3 minutes or until there are no more changes to the display.
3. Count the number of individual channel traces and compare to the design goal.

Test Results:

Frequency Range	Number of Hopping Channel
2.40000-2.48000GHz	75

Please refer to attached spectrum plots.

37.5dBm 10dB/ 79.0MHz



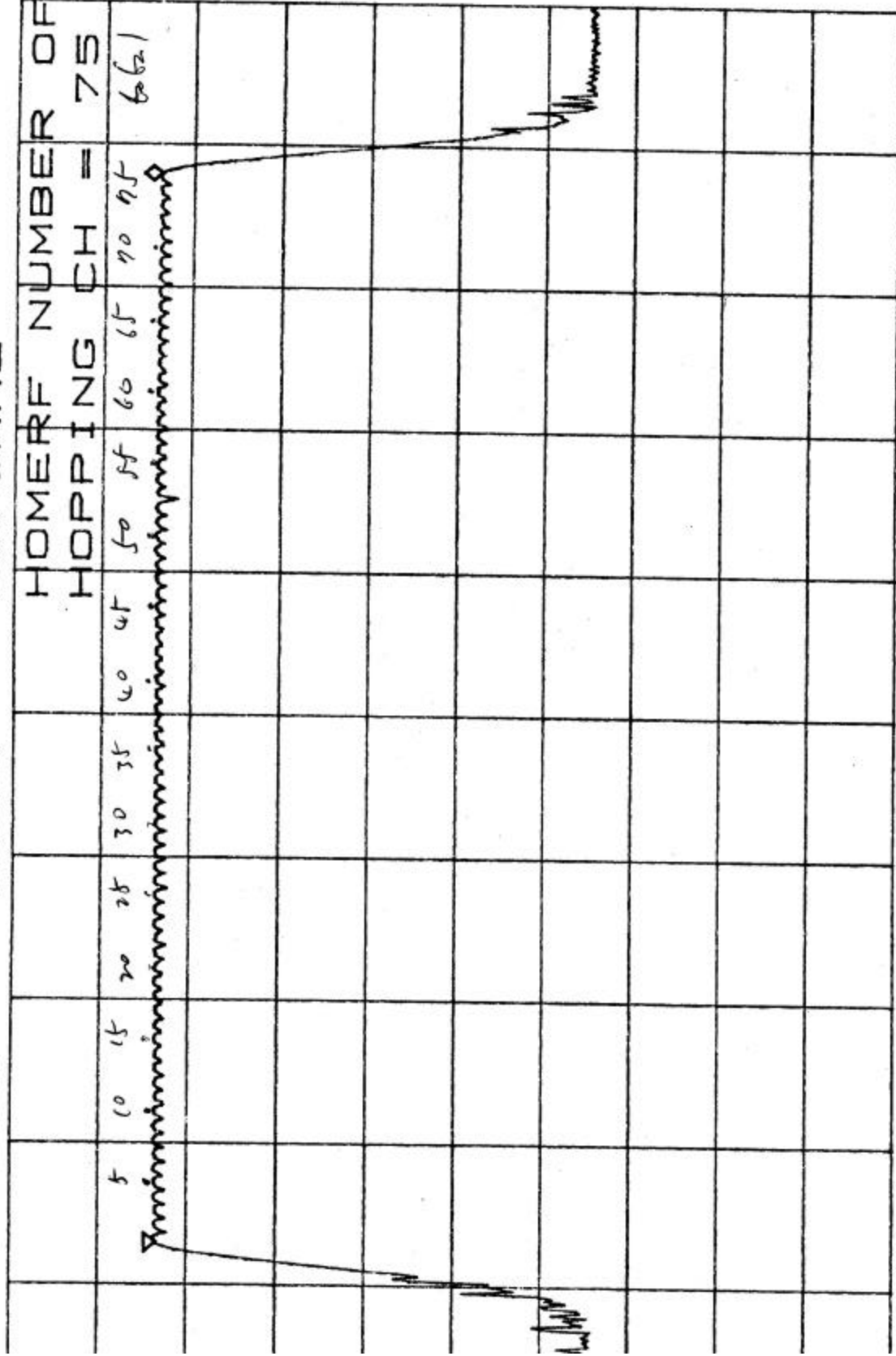
49 channels
5c

INTER 2.4400GHZ SPAN 100.0MHz
V 1.0MHz VBW 1.0MHz SWP 50.0ms

37.5dBm

10dB/

75.0MHz



NT channels
OK
SC

66.1

66.1

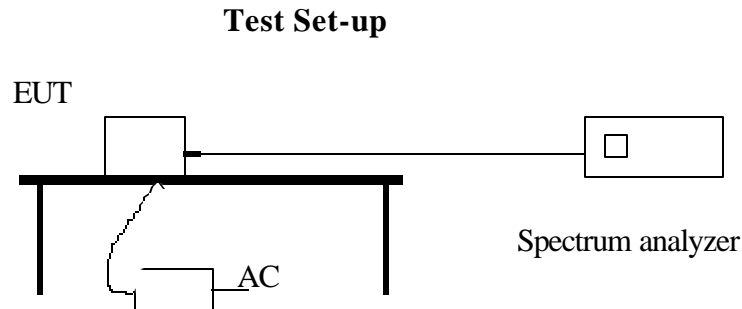
INTER 2.4400GHZ SPAN 100.0MHz
/ 1.0MHz VBW 1.0MHz SWP 50.0ms

Hop Channel Separation

Test Requirement: 15.247(a)(i)

Measurement Equipment Used:

HP 8566B Spectrum Analyzer



Test Procedure:

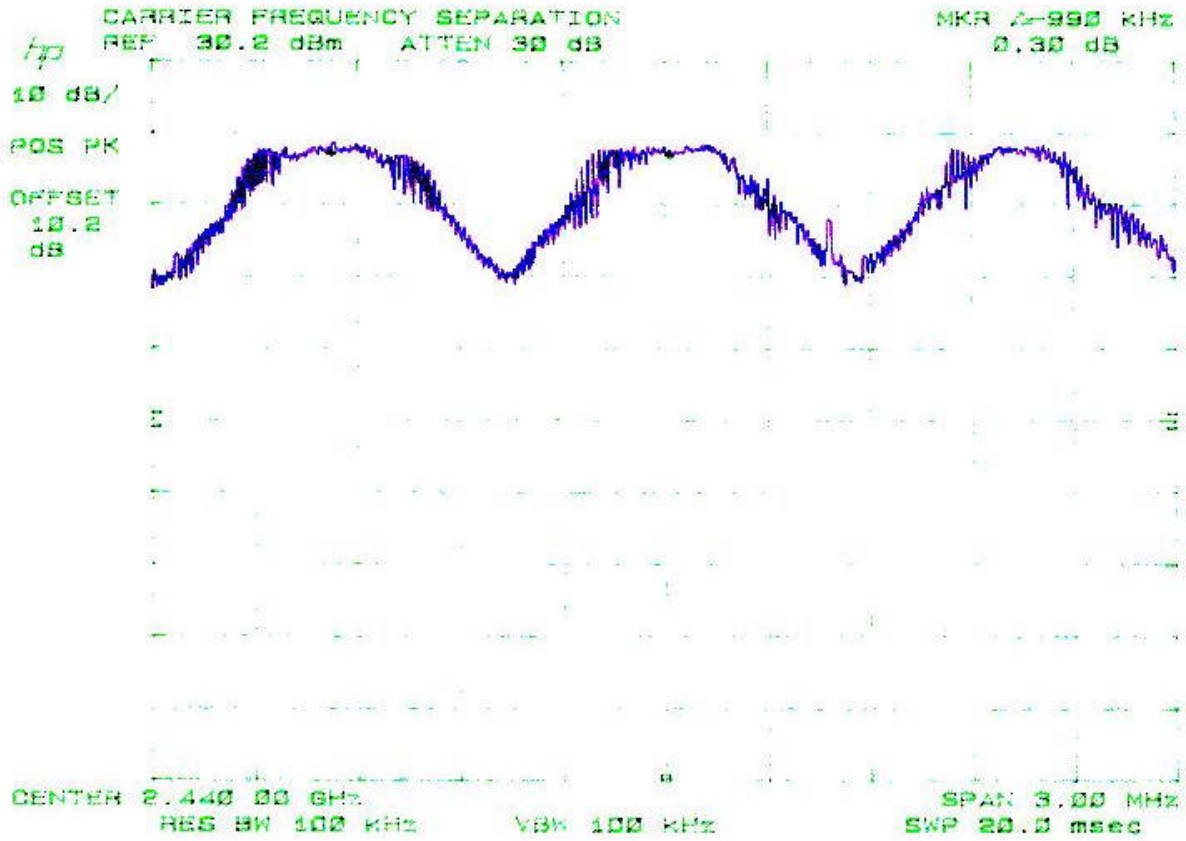
The RF output port of the EUT was connected to the spectrum analyzer through a 6 inch RG-316 cable. Total path loss including cable and attenuator at 2.4-2.5 GHz was 10.2dB.

Turn on the transmitter in normal hopping mode. The emissions will “paint” the spectrum analyzer screen with individual traces from each transmit channel. Allow the transmitter to run for at least 3 minutes or until there are no more changes to the display. Move MARKER to the channel, which appears to have widest Channel separation and calculate the DELTA between two markers.

Test Result:

Please refer to attached spectrum plot.

Measured 990kHz > 25kHz (limit)



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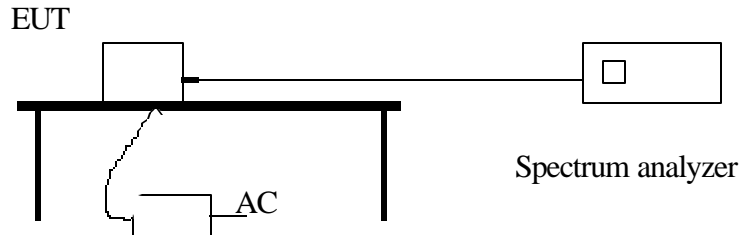
Average Time of Channel Occupancy

Test Requirement: 15.247(a)1 (ii)

Measurement Equipment Used:

HP 8566B Spectrum Analyzer

Test Set-up



Test Procedure:

The RF output port of the EUT was connected to the spectrum analyzer through a 6 inch RG-316 cable. Total path loss including cable and attenuator at 2.4-2.5 GHz was 10.2dB.

Set the transmitter to operate in its normal frequency hopping mode.

Set the spectrum analyzer Center Frequency at 2.440GHz. Set the Sweep Time to 30 seconds. Set Trace to Max Hold. Set the Amplitude function to Linear.

The maximum number of transmissions detected in any 30 Second periods determines the maximum time of channel occupancy.

The duration of each transmission is measured with RBW=VBW=300kHz. SPAN set to 0 Hz. SWP set to 50.0msec.

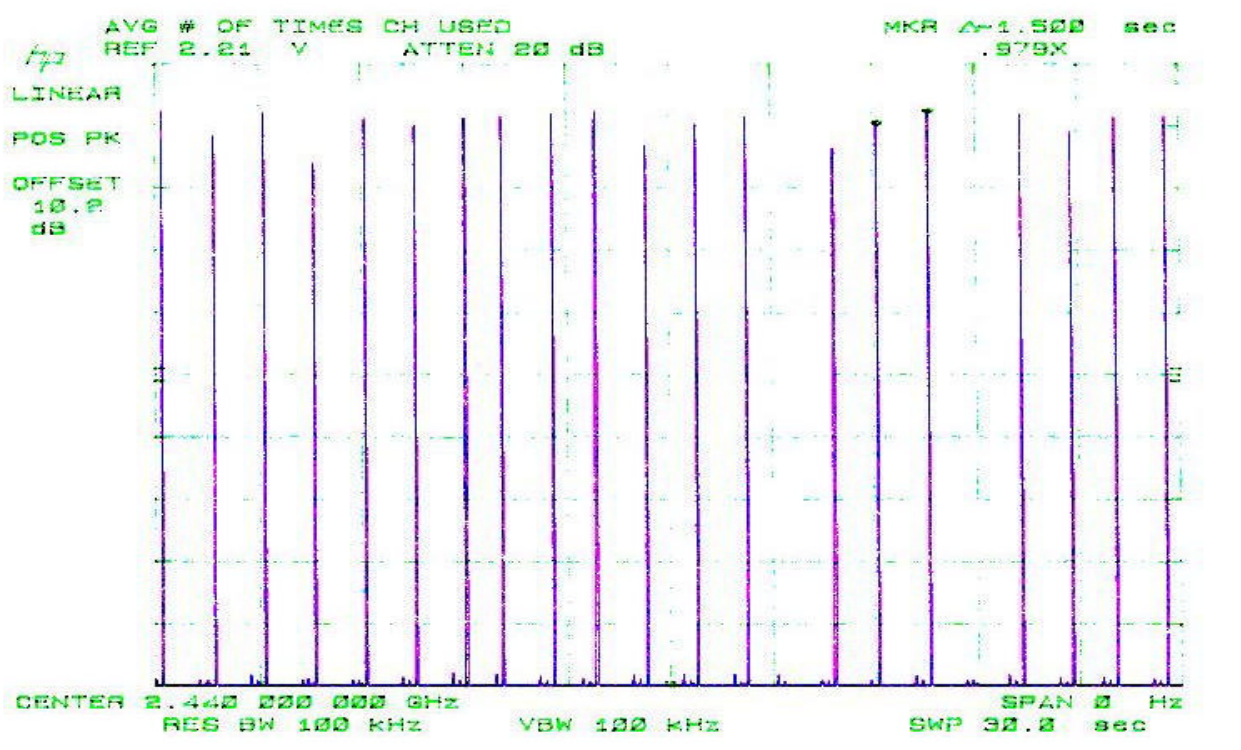
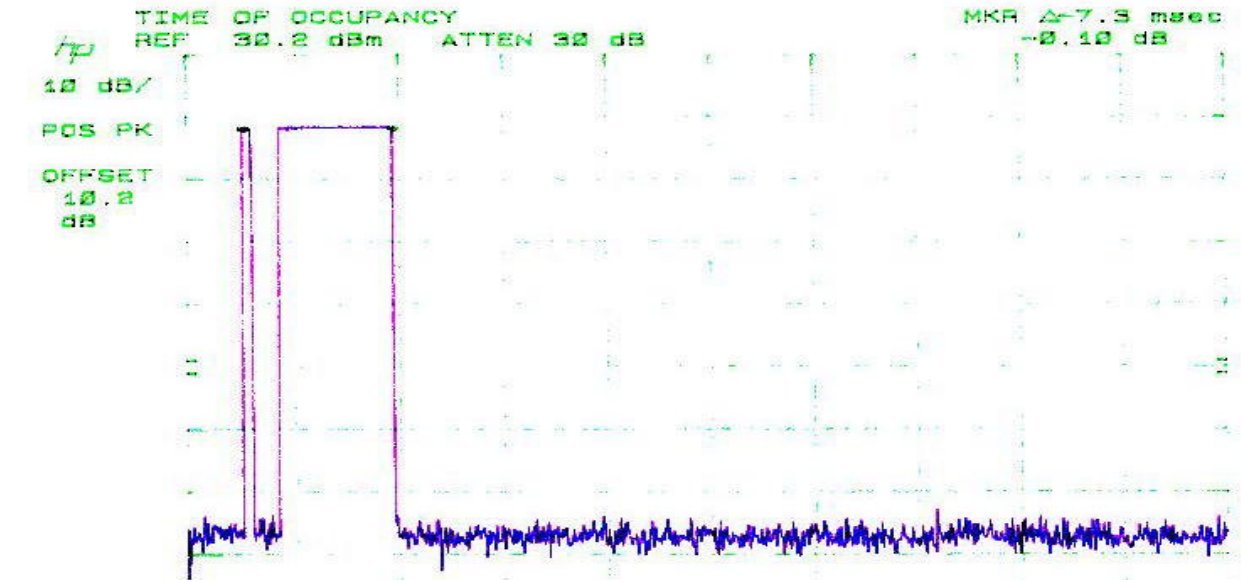
Test Results:

Average time of single channel occupancy: 0.0073 seconds

Average number of times any individual channel is used within any 30 seconds: 20

$20 \times 0.0073 = 0.146 \text{ second} < 0.4 \text{ second (limit)}$

Please refer to attached spectrum plots (two pages)



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